

SOVIET LAND

THE COUNTRY, ITS PEOPLE
AND THEIR WORK

BY

G. D. B. GRAY

WITH EIGHTY-FIVE PHOTOGRAPHS
AND 141 MAPS, DIAGRAMS AND DRAWINGS

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PREFACE

THIS book has been designed to give a comprehensive and objective account of the geography of the U.S.S.R., and of some of the implications of that geography, in particular by treating of the U.S.S.R. as a world unit and not as two separate parts of two continents. Only through a knowledge of the geographical and historical background of Soviet Russia can a real and permanent understanding emerge between her peoples and those of the English-speaking world.

An attempt has been made to present much of the information in a diagrammatic and pictorial form and to use specifically Russian examples to elucidate some general principles of geography, climate, agriculture and industry. Furthermore, the main formative periods of Russian history have been rapidly surveyed to show the continuous operation of geographical factors. Some, like climate and distance, have always been apparent to man; others, have remained but latent potentialities until their rapid development during the last two decades under Soviet rule.

The U.S.S.R. is too large an area to be seen and understood by one person, and although I have seen something of the country and the people I have had to rely on much secondary material. While no claim is made that this book goes beyond the factual information which is to be found in the standard accounts of the U.S.S.R. and Russia, it is hoped that the method of treatment will prove both stimulating and helpful.

It does not seem possible to use a system of transliteration of the Russian names which is satisfactory in all respects and the simplest form in common usage has been employed.

G. D. B. GRAY.

LEAVESDEN.

October 1946.

ACKNOWLEDGMENTS

To all those many friends who have given help and advice I offer my grateful thanks. In particular I would thank the Society for Cultural Relations and especially Miss Judith Todd, as well as Mr Konstantin Voronkov of V O K S. in Moscow, for supplying the photographs, most of which have never previously been reproduced in this country. The text-figures were all re-drawn by Mr H. A. Bennett from my originals, and I owe him many thanks. I am also indebted to my two friends Mrs. Olga Brodie-Fraser and Miss Margaret Price for the line-drawings of peoples and plants respectively. To my former colleagues I owe much, in particular to Professor S. W. Wooldridge, Mr W. G. East, M.A., Mr H. W. S. Urch, B.A., Dr E. G. Balls, for their help in reading the manuscript and proofs and for making many useful suggestions. I must also thank Professor David Linton and Professor Gordon Childe, the Curator of the Natural History Museum and the Director of the Botanical Gardens, Kew, for their willing help in answering my many queries on specific points. I would also thank my present colleagues, Mr. L. Laic and, Mr E. B. Dobson, B.A., for their help with the final stages of the book, and Miss J. Spickett for so kindly typing my work. Finally, where opinions are stated in the text they are entirely my own.

G. D. B. G.

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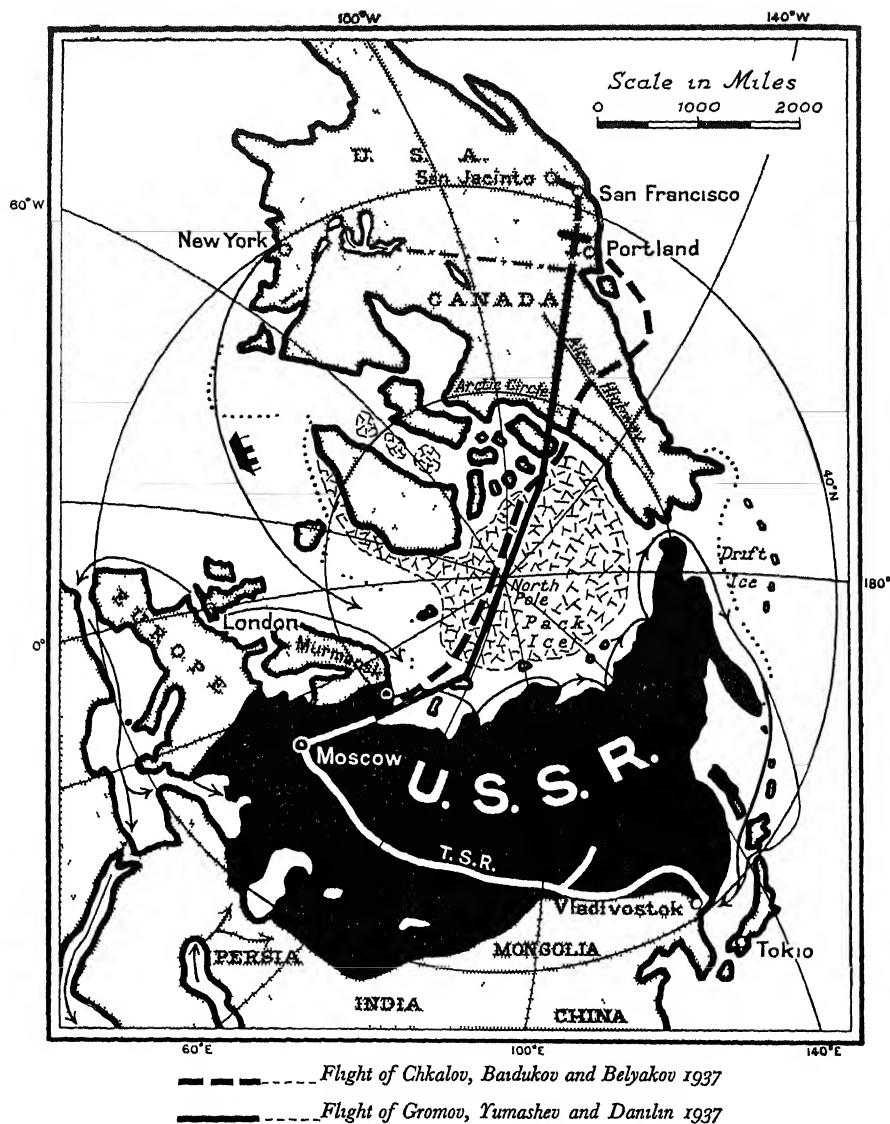


Fig 1.—LOOKING DOWN ON THE POLE.

The Arctic Ocean is the new "mediterranean" sea and is assuming great strategic importance. The fact that U.S.A. is on the other side of the North Pole from the U.S.S.R. was brought to light quite forcibly in 1937 by the Soviet flyers. The Northern Sea Route was of vital importance during the Second World War just as was the Northern Convoy Route by which supplies were sent. American planes were sent to Russia via Alaska but the shorter Polar Route will be the route of the future.

Part I: The Country

CHAPTER I

POSITION AND SIZE

RUSSIA, or to call it by its proper name the Union of Soviet Socialist Republics, lies east of the British Isles. For over 6000 miles it is in contact with the Arctic Ocean in the north while the Pacific Ocean washes its eastern shores. The land frontier in the west has since 1940 bordered East Prussia, Poland, Czechoslovakia and Rumania, for in that year the Baltic states of Estonia, Latvia and Lithuania were admitted into the Union of Soviet Republics. In the south the borders are formed by Turkey, Iran or Persia, Afghanistan, India, Sin-Kiang (or Chinese Turkistan), Mongolia and Manchuria. The last-named was occupied by Japan from 1931 until it was liberated by the Soviet forces in 1945. As can be seen in Fig. 1, on the other side of the North Pole lies the great North American continent, and actual land contact with the American territory is only prevented by the narrow Behring Straits which are 56 miles across between Alaska and the Chukot Peninsula of Siberia.

In the past what is now the U.S.S.R. used to be split into two parts called "Russia in Europe" and "Russia in Asia," the separating line being the Ural Mountains. The area surrounding the Caspian Sea, now called the Central Asian Republics, was formerly known as Russian Turkistan. Such a piecemeal subdivision of the U.S.S.R. is quite unsatisfactory, especially when the western part is described in a book dealing with Europe and the remainder in a book on Asia.

The U.S.S.R. is now one large country, a nation made up of many peoples, who live in the most varied surroundings and occupy the northern part of the greatest continental landmass, Eurasia. As will be seen later this country includes the area where the transition takes place between Europe and Asia. This change is gradual and it is difficult to see on the ground any indication of a line separating European landscape, climate or peoples, from those typical of Asia. The line was, therefore, drawn in an arbitrary fashion along the Ural Mountains, for this is the only range of high ground which rises above 1000 feet between Northern France and the river Yenisei.

Asia is noted for its teeming millions of people. These are to be found living by peasant farming in the alluvial river valleys of South-East Asia. India has almost 400 millions and there is over that number in China.

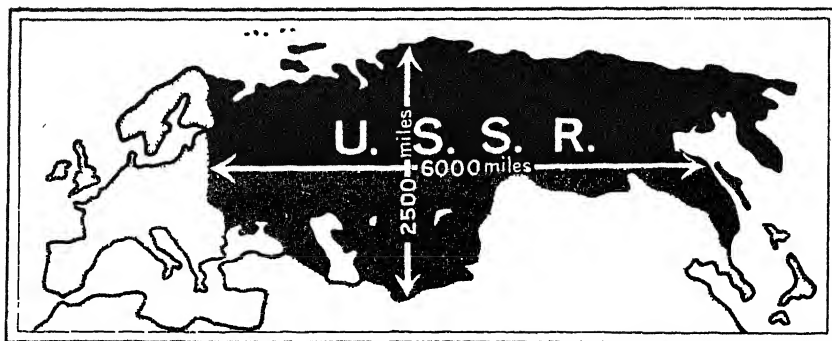


Fig 2.—THE SIZE OF THE SOVIET UNION.

The U.S.S.R. appears as an enormous country when compared with the insignificant size of the British Isles. Its total area is about $8\frac{1}{2}$ million square miles which constitute almost one-sixth of the earth's land surface. The large areas of hot and cold deserts must not be forgotten.

Together they make up nearly half the population of the whole world. These people to-day are separated from the U.S.S.R. by the great expanse of high mountain ranges, plateaux and semi-desert basins. This region of desert supports but few people and is a kind of negative area where life is very difficult; it acts as a barrier to free movement. However, in the past, peoples have moved out of this Central Asian region into the northern plains now included in the U.S.S.R.

SIZE

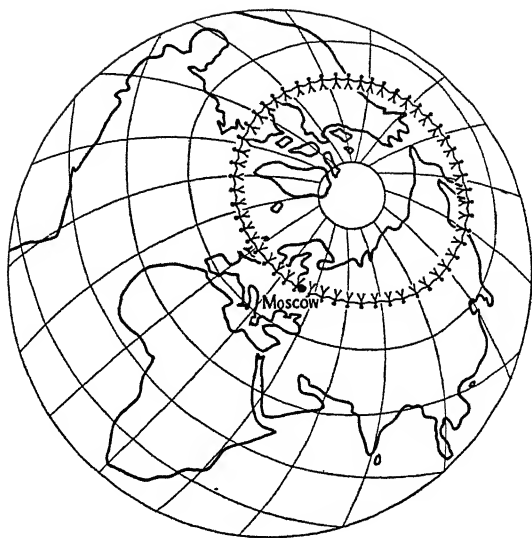
The U.S.S.R. is so large that it is almost true to say that the sun never sets over this vast country. When the people are waking up in Leningrad others in the East are thinking of going to bed. From west to east this country stretches continuously almost half-way round the world, that is from 22° E. longitude to beyond 180° to 170° W., a distance of over 6000 miles, or equivalent to about twice the distance across the U.S.A. This is the distance that would be travelled in going from Southampton to New York and back again, or from London to Capetown (see Fig. 2).

The distance is only about half this from north to south in its widest section from the mouth of the river Ob to the Afghanistan frontier. This is a stretch of 2500 miles from 35° N. to 78° N. latitude. These facts of course imply more than mere figures; they also mean that the climate changes from one where cotton is grown to one where the ground is always frozen just below the surface and where few plants grow (Fig 1).¹

¹ Fig 1 is drawn on an "equal area" projection and areas are, therefore, correct all over the map. This is not so on Fig 23 which is on Mercator's projection. The advantage of this is that directions are true though areas are false.

Fig. 3.—AN IDEA OF THE
POPULATION OF THE
U.S.S.R.

If all the people in the Soviet Union were to stand hand in hand along the line of latitude which runs through Moscow they would stretch round the world



The mere statement that the U.S.S.R. covered over 8 million square miles in 1941 does not really bring home its tremendous size to the reader. But a glance again at Fig. 1 will show that the British Isles will fit into the U.S.S.R. some seventy times ! The U.S.S.R. is even larger than the whole North American continent and about two and a half times the size of the U.S.A.

This gigantic state covering a sixth of the earth's surface is the largest stretch of continuous land under one government. Its population too is of the same large proportions. In 1941 there were nearly 200 million people in this union of sixteen republics. Some idea of what this means can be got by realising that if all these people were to hold each other's hands they would form a ring stretching from Moscow almost round the world (see Fig. 3) ; or that if they were to walk briskly past you in a single file, the procession would take about six years from first to last !

As a result of the size of the country alone, the weather conditions would hardly be expected to remain uniform through the length and breadth of the Soviet Union. Nor do they.

CHAPTER II

PHYSICAL FEATURES

THE BROAD SCENIC UNITS

THE large area of land below 600 feet usually coloured green in atlas maps is the most apparent feature of the landscape of the U.S.S.R. This is the greatest of the world's plains. It is the eastern extension of the Great European Plain which widens in the form of a wedge through Poland and the western regions of the U.S.S.R., reaching its maximum width in the neighbourhood of the Urals. It must not be presumed that the Urals present a formidable obstacle. They do reach over 5000 feet at several points, but even so roads and railways can cross this range at little over 1000 feet. The plain continues both to the east and to the south into the basin of the river Ob in Siberia and into the Central Asian Republics.

In a very rough diagrammatic fashion (Fig. 4) this plain area may be summarised as two triangular tracts of country with a common base along the Urals. To the west there is the *West Russian Plain* and to the east the *Western Siberian Plain*. Further east, between the Yenisei and Lena rivers, there is a trapezium-shaped region which is a step higher and can be called the *Central Siberian Plateau*. Still further east, there is another region, of similar shape and still greater in altitude, called the *Ranges of Eastern Siberia*. The last important unit comprises the *Southern Mountains and Plateaux* which form the greater part of the land frontiers of the U.S.S.R. The Pamirs are so high that they are often referred to as "the roof of the world." These southern mountains roughly correspond to the major physical boundary between the Northern Plain and the complex arrangement of mountain ranges and high intermontane plateaux of Central Asia.

THE RIVER PATTERN OF THE U.S.S.R.

The river pattern is important, for it is the rivers which have etched out the minor relief features. The Russian rivers are among the longest in the world. The Yenisei, together with the Selenga, is over 3500 miles long. The Lena is only slightly shorter, being 2770 miles long. In addition, the Amur (2780 miles), Ob (2500 miles) and Volga (2310 miles) contribute many thousands of navigable waterways within their drainage basins (Fig. 4). Not only are the rivers long, but also very broad. The Volga is about two miles wide at its confluence with the Kama. The Ob is a quarter of a mile wide at Barnaul in the Kuzbas, but can be over three miles where it joins the Irtysh.

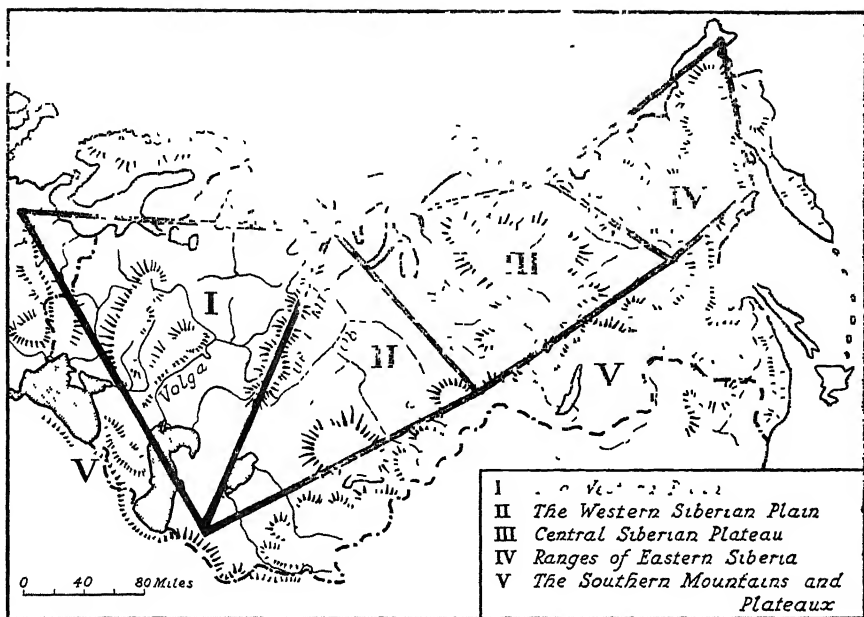


Fig. 4.—THE MAJOR SCENIC UNITS.

In very broad terms the U S S R. falls into five main physical units ; two are great plains separated by the Urals , two are high mountain ranges and one a high plateau.

The river network falls into the following four groups .

1. *The Radial Pattern of the Rivers West of the Urals*

The point of divergence for the western rivers is a little west of Moscow ; these rivers flow outwards . The Western Dvina flows into the Gulf of Riga ; the Northern Dvina flows northwards to the White Sea ; the Volga and Oka drain east and south into the Caspian ; whilst the Don, Dnieper, Bug and Dniester drain towards the Black Sea.

2. *The Area of Interior Drainage of the Aral-Caspian Depression*

The Volga is strictly part of the inland drainage system of the south-west of the Soviet Union. However, there are other smaller rivers like the Araxes, Kura, Terek and Kuma, flowing eastwards from the Caucasus ; the Ural river, drawing its waters from the Southern Urals ; and the Amu- and Syr-Darya which flow into the Aral Sea . There are others, like the Chu, which never reach the sea, and others which end in lakes, like the Ili flowing to Lake Balkash.

3. *The North-flowing Rivers of Siberia*

The Amu- and Syr-Darya do not receive sufficient water to take them across the great northern plain, but to the east the great Siberian rivers succeed in doing so and have their outlet in the Arctic Ocean. The Ob, Yenisei and Lena are veritable giants besides which the Rhine and Thames would appear as mere tributaries. The Ob collects together the Tobol, Ishim and Irtysh. Flowing from the east into the Yenisei are the Lower Tunguska, the Stony Tunguska and the Upper Tunguska. The latter is really the continuation of the river which flows out of Lake Baikal as the Angara. The Lena is joined on the left bank by the Vilyui and on the right by the Vitim, Olekma and the Aldan.

Between the Yenisei and the Lena there are three smaller rivers flowing directly into the Arctic Ocean; the Khatanga, Anabara and the Olenek. East of the Lena there is another group of three smaller rivers; the Yana, Indigirka and the Kolyma, which flow into the Arctic Ocean.

4. *The Rivers flowing East into the Behring Sea and the Sea of Okhotsk*

Only one large river, the Amur, breaches the eastern rampart of mountains. The other rivers are quite short and of steep gradient, the most important of which are the Anadyr, the Penzhina and the Kamchatka.

Rivers have played a prominent rôle in the history of the peoples of the U.S.S.R.; without exception all the rivers suffer from the defect that they are frozen for some period during the winter months. To make matters even worse, the Siberian rivers, despite the fact that they provide miles of navigable waterways, have their outlet into the Arctic Ocean which is frozen for the greater part of the year. Thus it is that the natural outlet of Siberia by river is from south to north whilst the routeways of man lead in a west to east direction. Had this been otherwise the development of the land east of the Urals would not have been delayed until the twentieth century. There is no doubt that the increasing traffic along the Northern Sea Route (see pp. 268, 270) will help towards the fullest use being made of these great rivers during their short open season.

These main features of the landscape of the U.S.S.R. are visible even on the small scale atlas map. If a visit were paid to the Soviet Union many of these generalisations would not be so evident on the ground. It would be noticed that certain areas had but little soil and consisted of very hard rocks studded with lakes. Other areas would appear undulating and irregular with deeply entrenched rivers. Some mountains would show rounder and smoother lines, others would possess steep slopes with sharp peaks silhouetting a saw-like outline against the sky.

In order to grasp clearly the reasons for these differences, it is necessary to understand a little about the history of the rocks which make up this part of the world now called the Soviet Union.

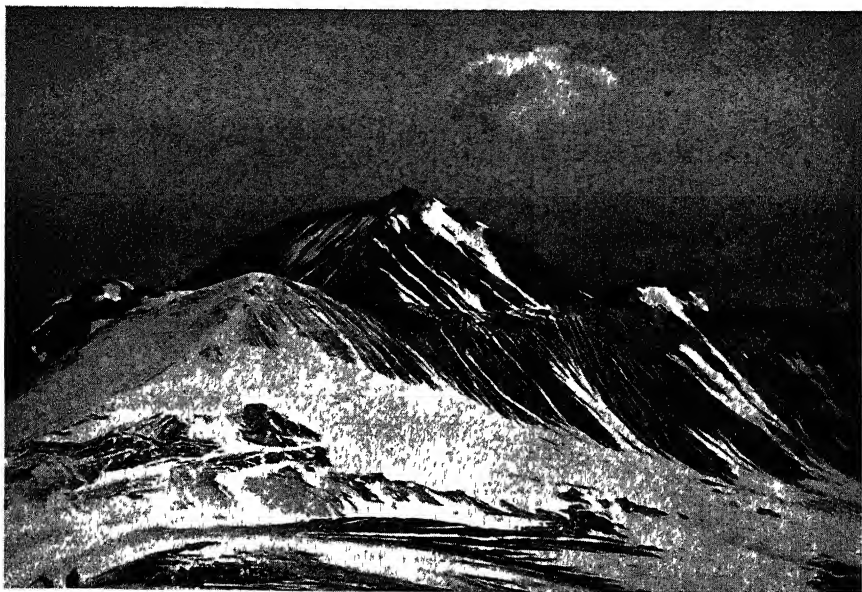


Plate 1.—MOUNTAIN BACKBONE, KAMCHATKA.

The slopes are concave and show the effect of glaciation and frost action. In the distance, the beginning of corrie-formation can be seen. The banner-cloud is due to an eddy current to the lee of the mountain peak. The air must be moving from the left.

THE MOUNTAINS OF THE U S S R.

At certain periods of the earth's history rocks originally deposited at the bottom of great seas have been folded up into mountains just as the tablecloth can be rucked up into folds. The last time this happened, folded mountains were produced stretching from the Alps to the Himalayas and into the East Indian Islands. This event took place quite recently in geological time, but it may have been a matter of 50 million years ago! Nevertheless these mountains form the highest ranges in the world. They look young and fresh and newly formed.

In the U S S R. the representatives of this period of mountain-building, called the *Alpine*, are true to type. They include the Crimean Range and continue through the Caucasus, the Kopet Dagh and the Pamir "Knot," and they link up through the Himalayas with the mountains of Burma and the East Indies. Thus these alpine mountains of the U S S R. abut against the "roof of the world." Mountains of this same age girdle the Pacific and extend through Sakhalin and the Kurile Islands and into Kamchatka.

These are the unstable parts of the earth's crust, and so it is not surprising to find that earth-tremors are frequent and that molten lava has been poured out through volcanoes in cones and through fissures in sheets.

Further back in time, perhaps 250 million years ago, mountains were formed after the deposition of the chief coal rocks of the world. Earth-folds of this period are found in the Urals, the Kazakh Uplands and the Altai. It is sometimes called the *Altai period* after this latter range, but other names for it are *Hercynian* or *Armorican*. As would be expected the mountains have suffered the rigours of weathering and erosion much longer. They have been compressed and fractured at least twice, and so usually the rocks are harder, the land-forms smoother and outlines more rounded. Steep escarpments may be found where vertical movement has taken place along the old faults or fracture lines.

Two or perhaps three other periods of mountain-building have taken place. Thus the older rocks of the U.S.S.R. have been through several periods of "earth-storms" and in some cases the original rocks have been entirely changed. In addition, with repeated folding, old rocks become even harder and more resistant to the ordinary processes of weathering. It is during times of violent earth-movement that molten rocks are pushed amongst other rocks. In this way large granite masses may be formed and later exposed after a long period of erosion. Most important of all, mineral veins containing precious metals and other substances are also produced at such times. Crystals of the minerals can be seen lining the fissures or cracks in the rocks (see Fig 108). It will not be surprising, therefore, that some of the mining regions of the U.S.S.R. are to be found in the mountains and plateaux which have been involved in several periods of mountain-building.

Many of these areas are only mountains in the sense that they were once folded into high mountains. Now, they have lost their original form. They may have been worn down almost to plains, i.e. "peneplains." Later these peneplains may have been fractured and uplifted as block mountains and plateaux. Thus areas of old, hard rocks really represent the worn down "roots" of former mountain structures and are called "shields." Such is the region of the Central Siberian Plateau which to-day is quite high, but a similar area at a lower level is found in the Baltic Shield, or Fenno-Scandia. This comprises the area to the north-west of Lakes Onega and Ladoga and along the west coast of the White Sea. It includes the Karelo-Finnish Republic and the Kola Peninsula. This is geologically the oldest part of the Soviet Union and is continued as the underlying floor or platform of Eurasia which is usually referred to as the Russian Platform. It is upon this base that younger rocks have been deposited in former seas on the site of the western plains.

The upper rocks which form the plain are almost horizontal over many square miles. However, the horizontal nature of these rocks should not be

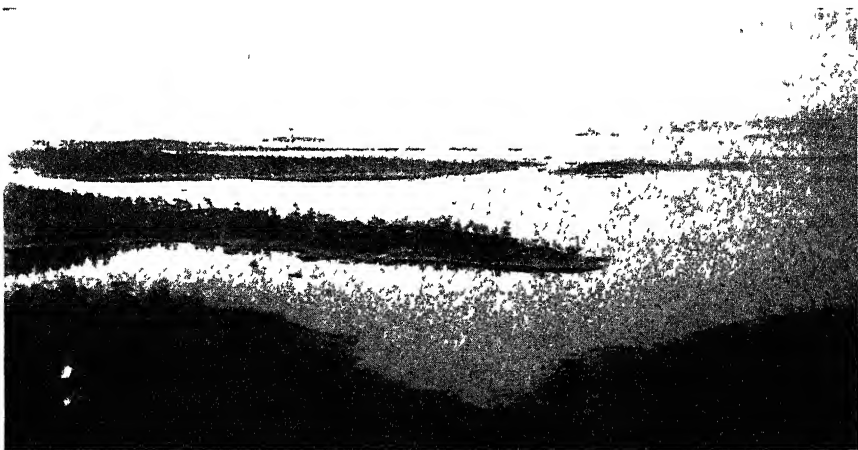


Plate 2 —LAKE-STUDDED KARELIA

This is reminiscent of Finland and Northern Canada. It is a glaciated peneplain, a region of forests and lakes. Timber is the chief export and 60 per cent of the people are engaged in the timber industry.

over-emphasised for there are several gentle downfolds and upfolds. For example, Moscow is the centre of a basin towards which the rocks dip in the same way as they do towards London and Paris. Limestones, sandstones and clay are all represented in alternating bands. It is of these materials that the *Central Russian Plateau* is formed.

In several places there are downfolds where coal of Carboniferous age is preserved, as in the Donetsk Basin, the Kuznetsk Basin, and the Karaganda coalfield. In contrast, the old hard crystalline floor comes to the surface along and to the west and east of the Middle Dnieper. Narrows and rapids occur at the "elbows" of the Dnieper, and it was not until the famous Dnieper Dam was constructed that the water was sufficiently raised in level to cover the hard rock bands exposed in the rapids at Zaporozhe.

THE EFFECTS OF GLACIATION IN THE U.S.S.R.

Following the Alpine period of folding and the building of the Caucasus and the Pamirs, the climate of the Northern Hemisphere became colder, and the Great Ice Age ensued. A large ice-sheet spread outwards from Scandinavia and covered the greater part of the northern and western plain (Fig. 5). Two big tongues thrust their way along the Dnieper and the Oka-Don valleys, that is to say on either side of the Central Russian Plateau. In addition, local ice-sheets with valley glaciers spread outwards from the high regions in the south and north, from the Caucasus, the

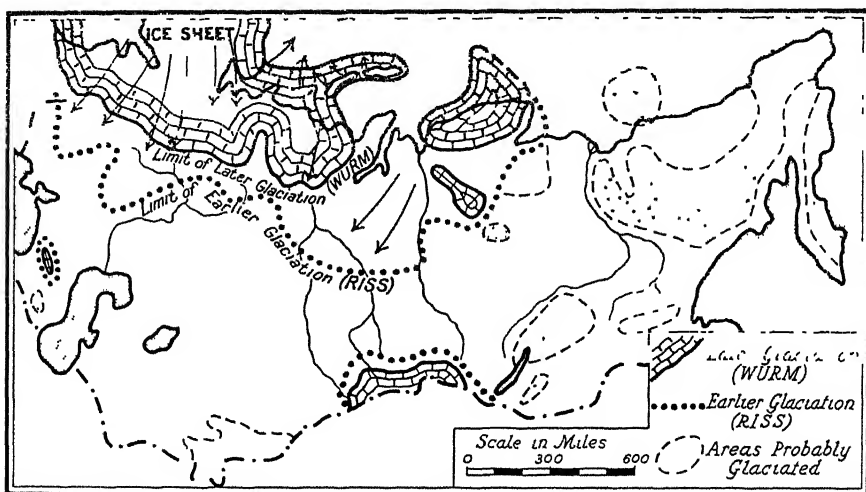


Fig. 5 —EXTENSION OF THE GREAT ICE-SHEET.

During the period of the Ice Age in Pleistocene times a vast ice-sheet spread out from Scandinavia and covered most of the British Isles, Northern Europe and the Northern and Western parts of the U.S.S.R. Other smaller sheets spread from the crests of the Caucasus and the mountains of Central Asia. These ice-sheets advanced and retreated four times; two of the advances are shown on this diagram

Northern Urals and the Central Asian Ranges This much is known because of the evidence left on the land-surface, and many of the detailed land-forms of the U.S.S.R. had their origin during this great period in the history of the earth.

When investigating the work of ice it is necessary to remember the difference between .

- (a) an *ice-sheet* which may cover hundreds of square miles of country, and
- (b) a *valley glacier* which is much smaller and usually occupies a former river valley.

A similar contrast is seen to-day between the ice-sheet of Antarctica and the valley glaciers of the Caucasus and the Pamir Range.

The landscape types which are seen as the work of ice differ greatly, depending on whether the area was near the centre or near the edge of the ice-sheet, and whether the ice has moved over :—

A Region of Hard Rocks

When the movement was over an area of harder rocks, especially near

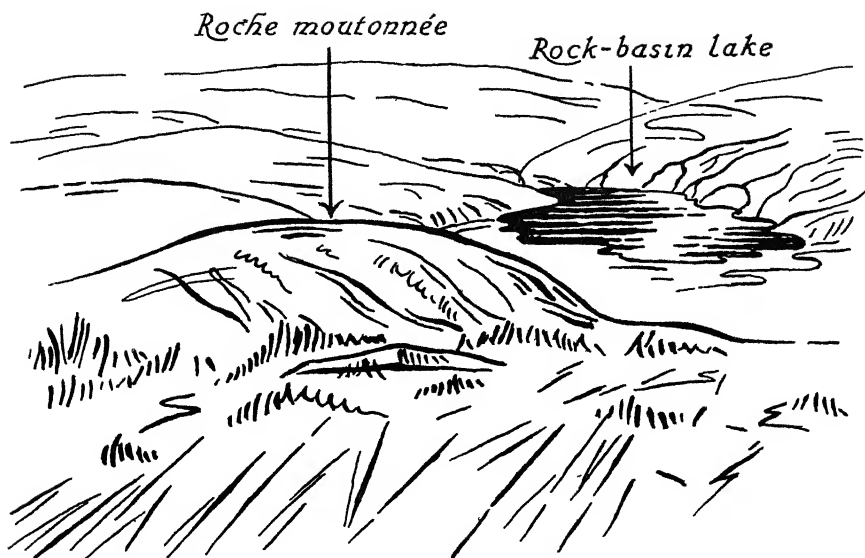


Fig 6.—A GLACIATED LANDSCAPE DEVELOPED ON HARD ROCKS.

This is the typical assemblage of land forms produced by the glaciation of a region of hard rocks near the centre of dispersal of an ice sheet. In the foreground the rocks have been scraped and scratched.

the centre of dispersal, the soil was scraped off the surface, and hollows were formed. These hollows, or rock basins, were usually occupied by lakes. The rock surfaces were smoothed and polished and often scratches or *striae* give a clue to the direction taken by the ice. As is seen in Fig. 6, some of the rocks were eroded into rounded masses or “*roches moutonnées*.” In appearance they often resemble crouching sheep, and have a gentle slope on the stoss side nearest the “on-set” of the ice, and a steeper and more rugged slope on the “leeward” side. Often, after the retreat of the ice, huge blocks of rocks were left perched on bare rock pavements. These may now be far from their place of origin and are called “*erratic boulders*” (Fig. 7).

A Region of Soft Rocks

The work of the ice in this case was not expended in wearing-away, or erosion, but rather in building-up. The countryside is plastered over by ice-carried material, sands, clays and boulders. This has happened in the lowland regions of the Soviet Union north of the line which indicates the maximum extension of the ice-front (Fig. 5).

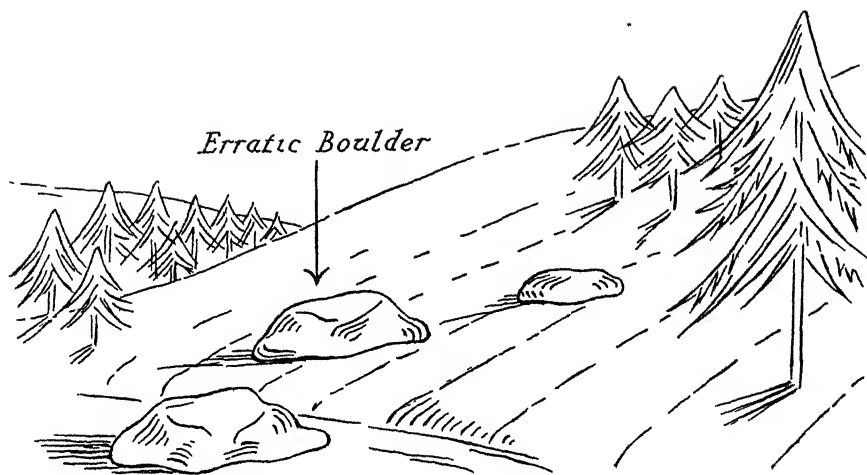


Fig. 7 —THE WORK OF ICE IN THE NORTHERN REGIONS

Very often the ice-sheets were able to carry large boulders or "erratic blocks" miles and miles from their original position. Rocks from the Arctic can be found in the Moscow region.

The chief features of lowland glaciation near the edge of the ice-sheet are :

1. *Ground Moraine*

Many glacial features were left by such an ice-sheet as it moved over lowland regions. The commonest is a cover of new rocks consisting of sands, gravels and clays which often contain large boulders. This general covering is called boulder-clay, glacial drift, or tillite, and represents material carried in or on the ice-sheets. Frequently this is just referred to as a ground moraine. Often irregularities are found in its surface. When a hollow is floored by an impervious layer of clay, it usually becomes the site of a lake. These lakes vary in size from large ones like Lakes Ladoga and Onega to others which are far too small to be shown on a small-scale map. There are, however, thousands of them in the north and north-west of the U.S.S.R.

2. *Terminal Moraine*

The next feature to be noticed is a ridge or embankment—the end or terminal moraine of an ice-sheet. This is really a mass of debris washed from the ice-front during the period when the movement of the ice was slight or non-existent. End-moraines are usually parallel to the former

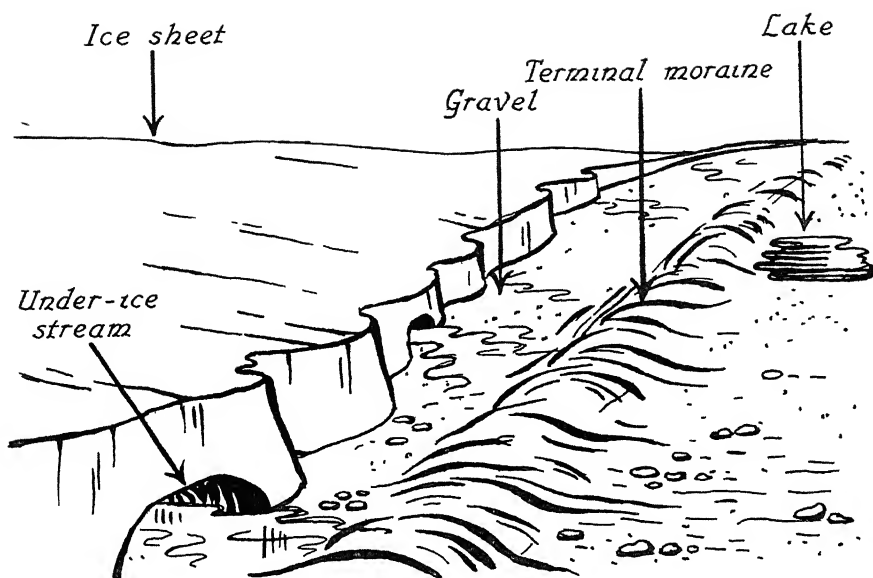


Fig. 8—HOW MORAINES WERE FORMED DURING THE ICE AGE

This attempts to reconstruct what happened when the ice-sheet actually covered Northern Russia. The sand, pebbles and clay which were carried in, on, or under the ice were deposited along the front edge of the sheet whenever the ice remained stationary

ice-edge. It is also common to find an area in front of a moraine, made up of gravel washed out by streams of melt-water issuing from the edge of the ice-sheet. When fields are ploughed up on this kind of terrain they are invariably stony. In parts of north-west U.S.S.R. the large boulders are the only readily accessible material for building-stone. They are collected to make road foundations or paving stones, and often they are used as corner-stones for the wooden houses. Geologists can trace the place of origin of these blocks and boulders, and it is from this information that it is possible to draw the arrows which indicate the direction taken by the ice in Fig. 5

The end-moraines, marking the stages in the retreat of the Scandinavian ice-sheet, are marked on Fig. 19, and it is an interesting fact to note that many important routeways have made use of these ridges of higher ground. By doing this, the lower-lying marshy areas of clay country have been avoided. For example, the railway from Daugavpils (via Pskov) to Leningrad, and the famous highway to Moscow used by Napoleon and by Hitler through Minsk, Orsha, Smolensk and Borodino, both run along the crests of end-moraines. In the lower country between the moraines, the bigger

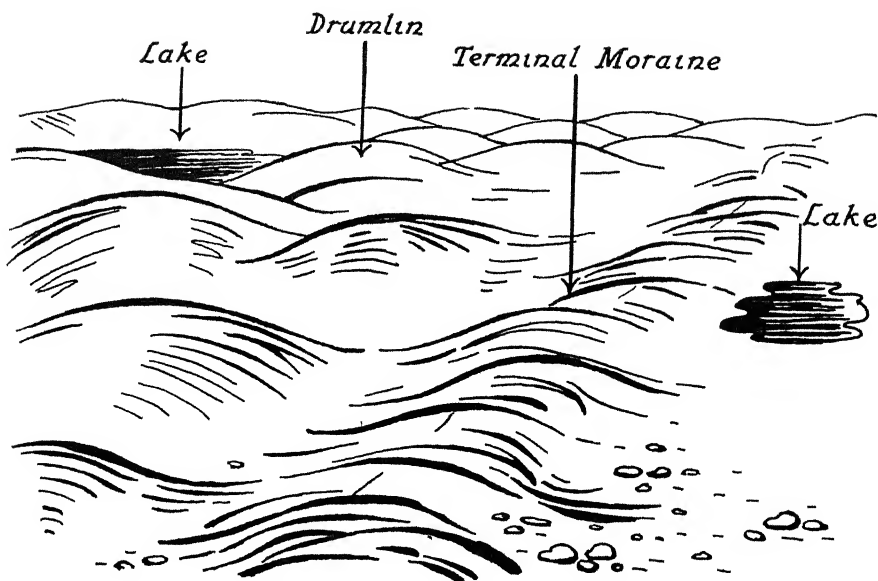


Fig 9.—GLACIATED LANDSCAPE AS SEEN TO-DAY.

The features which were moulded of boulder clay under the moving ice are called *drumlins*. The terminal moraines appear like long, sinuous embankments and the hollows of the land are often filled with water to form lakes.

lakes are found (Lakes Peipus, Pskov and Ilmen), and in early times movement in this region must have been most difficult except in winter.

There are several other kinds of hummocks and ridges which add a little diversity to the plains of north Russia. These have been called by geologists *drumlins*, *eskers* and *kames*, according to their varying mode of origin (see Figs. 9, 10, 11).

Such minor features, which may only rise a few feet higher than the surrounding country, must not be dismissed as insignificant details solely interesting to geologists. The point is that in a region of low relief, even these gentle ridges and hills, a few feet above the general level of the plain, determine drier areas above the marshy hollows. Hundreds of small villages in the forest lands of the U.S.S.R. are situated on these little hills and embankments. It was on them, especially on the south facing slopes, that the defensive stockades and the kremlins were built (see pp. 295-296).

3. Stream Diversion

After consideration it will be understood that the present river pattern only in part reflects the one which existed in pre-glacial times. In many

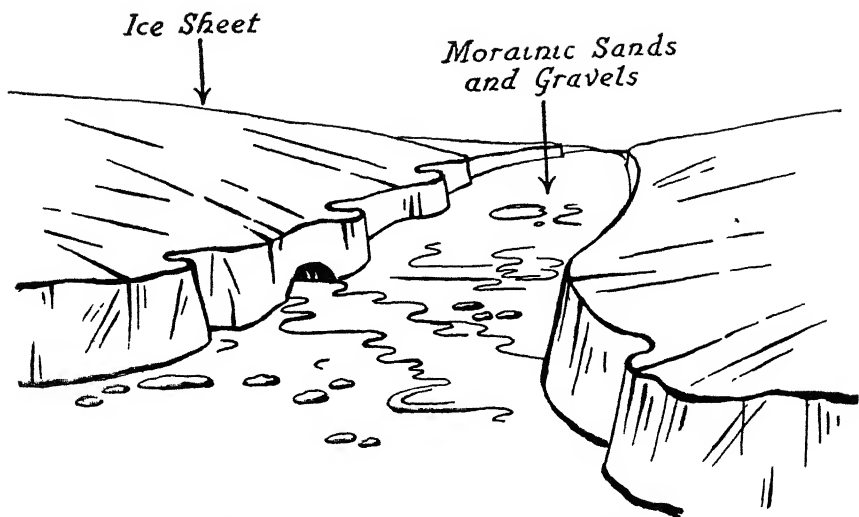


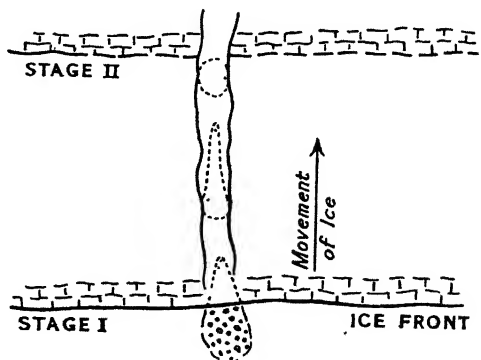
Fig. 10.—THE FORMATION OF A KAME

This represents the material from under-ice streams which collected in an embayment of the ice-front.

cases the former river channel was blocked by glacial drift, and after the retreat of the ice the river was forced to take another course. This fact explains the formation of some of the gorges and rapids. It is possible that the peculiar feature known as the "Samara Gates" near Kuibyshev was caused by a diversion of the Volga during glacial times, for there seems to be a trace of the older channel between Syzran and Ulyanovsk. In several stretches the Moscow river has been diverted and both the Upper Volga and Upper Dnieper travel from one former lake basin to another, and

Fig. 11.—THE FORMATION OF A BEADED ESKEK.

Eskers were probably formed by an under-ice stream which built up a delta at the edge of the ice-sheet. This also retreated with the ice-front, and formed a long ridge or elongated mounds



where a sudden change of gradient takes place gorges and rapids are found. The Volkhov has two series of rapids on its passage from Lake Ilmen to Lake Ladoga. Some of these rapids are due to glacial diversion but others are found where harder rocks cross the bed of the river. The Dnieper has rapids above the town of Orsha, and the Msta, a tributary flowing to Lake Ilmen, has rapids near Borovich. In both these cases the rapids are due to the crossing of a morainic barrier. Since water cannot flow uphill the river must have cut its way down and through the ridge, probably as it flowed out of a former lake on the upstream side. The rapids at Zaporozhe on the Dnieper are due to the river having cut down to the harder rocks of the Ukrainian massif.

These are just a sample of the landscape features which can be repeated many times in the northern and central regions of the U.S.S.R. The assemblage is typical of glaciated lowlands wherever they may occur.

The features of ice-sculptured mountains of the U.S.S.R. are not dissimilar from those to be found in other glaciated mountain regions. They include the following common land-forms:—

1 *Arêtes*

The high mountain ranges of the U.S.S.R., e.g. Caucasus and Altai, are typical glaciated mountains, just like the Alps or Rocky Mountains. To the ordinary traveller these are the spectacular and real mountains. On examination, a definite group of land-forms due to the work of ice can be distinguished. The crest-line of the ridges is seen to be serrated or saw-like. For these features, the French term *arête* is most commonly used. From these sharp edges the slopes descend in a concave fashion, and where the gradient changes there is usually an accumulation of rock-waste or *screes*.

2. *U-shaped Valleys*

The main valleys are U-shaped in cross-section and very straight in contrast to the V-shape of a water-eroded valley, which invariably has spurs where tributary valleys join the main stream. The tributary valleys of a glaciated region have very steep gradients and appear to "hang" into the main trough, so that waterfalls are common. The valley floor may sometimes be punctuated with a series of steps along its course, and any basin which may be formed is a likely place for a lake to develop. In other cases the glacier, on its retreat into the mountains, may have left a terminal moraine as an embankment across the valley. This again makes a natural dam suitable for the formation of lakes.

3 *Corries*

The lower valley sides are invariably steeper than the middle mountain slopes, and a bench or shoulder is found at the change of gradient. In

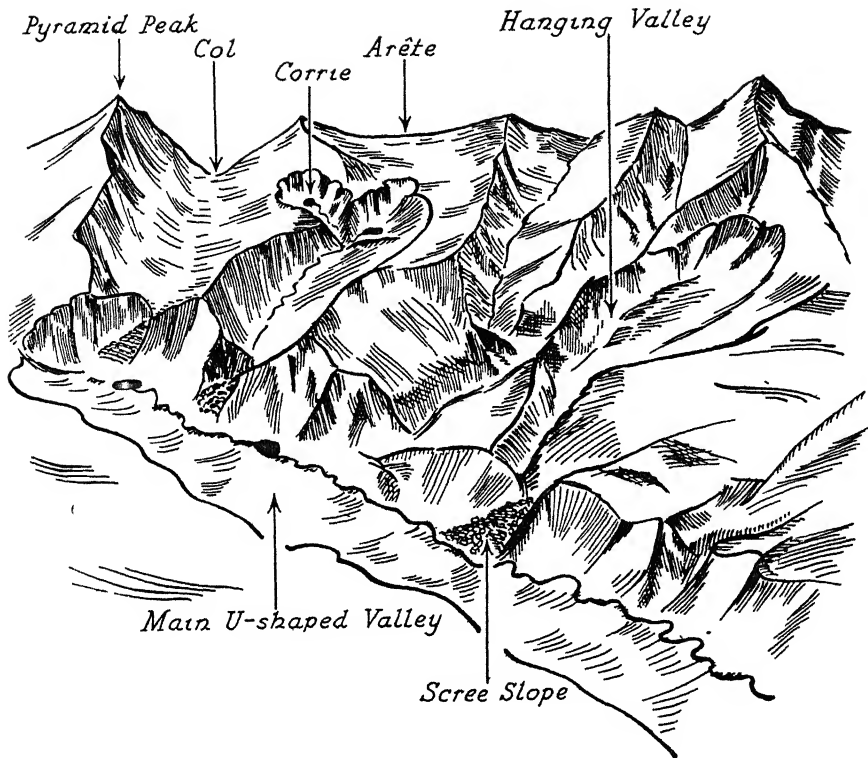


Fig 12 —AN IDEALISED VIEW OF GLACIATED MOUNTAIN SCENERY

Such a scene can be repeated many times in the Caucasus or the mountains of Central Asia. It might well be the Himalayas, Switzerland or South Island, New Zealand.

In Europe the upper slope is called the "alp," and it is in this region of the mountain that arm-chair-like hollows, or amphitheatres, are seen. These are generally called *corries*, but are known as *cwm*s in Wales and *cirques* in France. The bottom of the hollow is flat, and often a roundish lake may occur and act as the source of a small tributary.

4 The Peaks

Glaciated summits are sharp and jagged, and often resemble a pyramid with concave slopes. It is now thought that these are the result of corries on opposite sides of a mountain growing larger and eating away the intervening ridge. If three such corries intersect a pyramid-peak results, and when two of them meet the sheer knife-like edge of an *arête* is formed. At



Plate 3 —THE CAUCASUS

This shows the barrier nature of this mountain range. The higher slopes are snow covered above 9000 feet. The lower slopes are forested with hornbeam, oak and beech, especially in the west. Glaciation is the cause of the deep canyon-like valley.

a later stage, the level of the ridge may become lower and a gap appear. These gaps or cols are of great importance to man's movements in such difficult regions.

Landscape compounded of these individual forms is found well-developed in the western Caucasus, especially where the upper tributary valleys of the Kuban rise a little west of Mount Elbrus (Plate 3). One such valley, the Teberda, is particularly U-shaped. The sky-line of this region is serrated and many of the passes, e.g. the Mamisson, Klukhor and the Marukh, have been used throughout history. Ice lingers on the summits of the Caucasus to-day, and one of the glaciers is over four miles long. The line of permanent snow is lower on the northern slopes, and the glaciers there are more numerous and reach lower levels. This is a good example to illustrate the way in which the aspect of a slope affects its climate and consequently the activities of people inhabiting the region (see Fig. 118).

The upper tributary valleys of the Syr-Darya and the Amu-Darya, in the ranges diverging from the Pamirs in Central Asia (e.g. the Naryn),

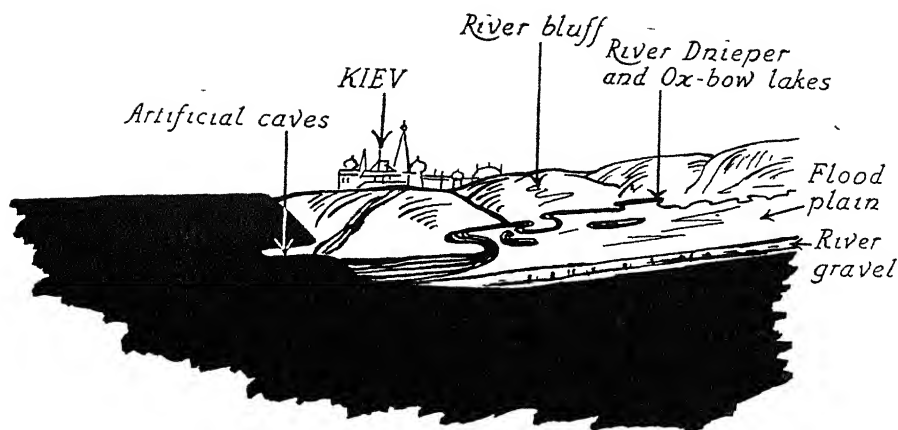


Fig 13 —THE DNEIPER VALLEY NEAR KIEV

This cross-section and view shows the asymmetry of the valley with the steep right bank. Most of the rivers of the Soviet Union, especially those running south to north or north to south display such characters. The high bank was picked out as a strategic site by the early settlers.

show the same marks of ice action. They have their sources in the glaciers and ice-fields. One of these, the Fedchenko, is said to be the greatest in the world, for it is forty-two miles in length. These glaciers yield a copious supply of melt-waters which enable the Central Asian rivers to cross the torrid deserts—it means life and food for the irrigated oases.

THE WORK OF RIVERS

Features of the South Russian Rivers

During the campaign of the Red Army in the Ukraine one feature of the rivers was often mentioned by war correspondents. They remarked upon the way in which the west or right bank of the Dniester, Dnieper and the Don is frequently higher than the left or east bank. This asymmetry of the river valleys is a notable feature and it had some bearing on the tactics employed during the Second World War. The old Russian scholars thought that this was due to "a curious tilt of the earth". Much later, a certain Von Baer suggested that it was due to the application of Ferrel's Law¹ to rivers. This idea now seems to be gathering much more support. It may happen that where, as in Russia, large rivers flow from south to north, or

¹ Ferrel's Law states that all moving bodies are deflected to the right of their course in the Northern Hemisphere, and to the left of their course in the Southern Hemisphere.

from north to south, the forces due to the earth's rotation can have full effect. This is partly helped in the U.S.S.R. by the simplicity of the rock structures over wide areas. The tendency for the water to move to the right would make the river cut sideways into its right bank. In course of time a river cliff or bluff is formed on the right bank. In the case of the south Russian rivers this is the west bank. The left bank is a low-lying, flat and marshy meadow. Even within historic times villages on the gentle bank have found themselves many miles from the river. These villages cannot in any case be built near the river, as they would be in danger from flooding. The most important towns of south Russia are situated on the right bank, e.g. Kiev, Cherkassy, Dnepropetrovsk, Nikopol on the Dnieper; and Gorki, Ulyanovsk (Simbirsk), Saratov and Stalingrad on the Volga. The edge of the Volga plateau at Stalingrad is a most impressive sight when seen from the low left bank. It looks truly mountainous, for the difference of altitude from river-level to ridge-top reaches a thousand feet, which is about twice the average height of the escarpment of the North and South Downs. It is also much higher than the Cotswolds' scarp.

For strategic reasons the towns were built on the tops of the river bluff. They dominated and commanded a view of the river traffic in the days of pirates and marauding Cossack bands. They offered some protection against the Tatar hordes moving from the south. Incidentally, there is also a strange resemblance between the way the monks of the famous Kiev monasteries excavated underground caves and catacombs in the banks of the Dnieper, and the way the defenders of Stalingrad dug shelters and hospitals in the river cliffs of the west bank of the Volga. However, some disadvantages attach to the steep bank and to towns built on the ridge-top, for here landslides are of frequent occurrence, and parts of the town may be undercut and rendered dangerous.

Of course, when the rocks are gently inclined across a river and dip to the west, this tendency to a high and low bank is still more likely to develop. As the river erodes its bed there is the tendency for the channel to slip, as it were, down the dip of the rocks. In course of time a river cliff or bluff is formed on one side. This work is helped by a meandering stream, for, as it swings across the flood plain, the convex loops of the meanders bite their way into the steeper bank.

On examination of Fig 19, it will be seen that both the Dnieper and the Don flow from north-west to south-east, and then suddenly turn at right angles, forming the now well-known Dnieper and Don "Bends." The real reason for this change in direction is that at one time the Black, Caspian and Aral Seas were one large sea. Into this the Dnieper, Don and Volga flowed south-eastwards down the natural slope. At a later period the sea shrank in size and divided into separate lakes at different levels, leaving the Dnieper and the Don to be drawn to the south-west



Plate 4.—THE DNEIPER VALLEY NEAR KIEV.

Almost without exception the rivers of Russia have one bank higher than the other. The Dnieper is flowing towards the bottom of the picture and is cutting into its right bank on the left. A broad flood-plain is visible with several islands along the river's braided course. The clouds are *strato-cumulus*.

into the Black Sea, while the Volga found its lowest base-level and outlet in the Caspian Sea.

It seems highly probable that at one time the Volga joined the Lower Don west of Stalingrad, for there is a very low col between the two rivers at the Don "elbow" opposite Stalingrad. This is the site of the projected Don-Volga canal. Similarly, at some stage in the draining of the Caspian and Aral Seas an old watercourse has used the route now occupied by the Manych and the lower part of the river Kuma. Another canal is in course of construction along this depression (see p. 268).

River Meanders and Ox-bow Lakes

The rivers of the U.S.S.R. are quite normal in their development and exhibit the usual features. In the plain-section meanders are produced which swing across a broad alluvial flood-plain. Some of these are later beheaded and ox-bow lakes are produced (Fig. 14). Other rivers develop

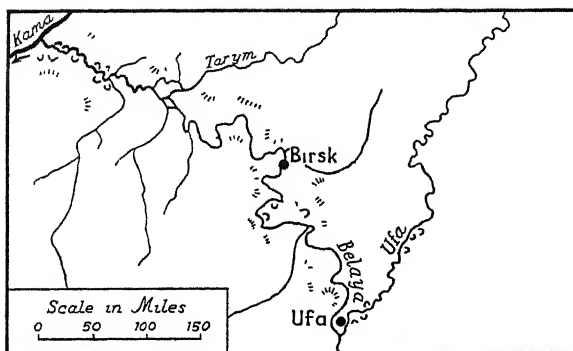


Fig. 14. — MEANDERS AND OX-BOW LAKES ALONG THE RIVER BELAYA

It is not always realised how large the Russian rivers really are. Many meander across broad flood-plains and display the usual features of ox-bow lakes and moving meanders.

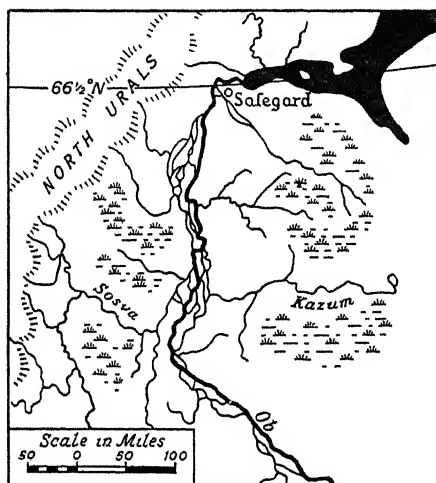


Fig. 15 -- A BRAIDED RIVER COURSE

It is common for large rivers to develop a braided course in their plain tract, especially after periods of flood. The river develops subsidiary channels along its flood plain, now one is the main stream and now another.

many channels in flood-time, producing a braided course. Often a series of islands made of sand and gravel is formed in midstream. These are to be found in the lower reaches of the Dnieper, Volga and Ob. They correspond to the "eyots or aits" of the Thames. In Russia they are called "zatony" and furnish sites for harbours on their downstream sides where shelter is possible from the moving ice in spring.

Dry Valleys

As in the limestone and chalk terrain of south-east England, dry-valleys are to be found in the plateaux of South Russia. These valleys only contain water during periods of thaw and heavy rain. Both road and railways

make detours to avoid these ravine-like valleys cut into the Black Earth region. The Russians call them "ovraghi," and attempts are being made to prevent their further development (see p. 179).

Portages

Before leaving the question of rivers one further feature should be pointed out; that is the way in which the headwaters of several streams come close together. The intervening watersheds are slight. This means that in the days when summer transport was chiefly by water it was easy to transfer from one river system to another. The boats had to be taken a few miles over what are called "portages." As we shall see, the history of trade-routes in Russia was greatly influenced by these portages, just as in the early stages of the development of North America.

It is possible to travel thousands of miles by small boat in the U S S R. with but a few breaks in navigation. For example, it is comparatively easy to transfer from the Dnieper to the Western Dvina and so reach the old port of Riga, thus making a through route from the Black and Baltic Seas. The Volga system connects by short portages with the Northern Dvina, or by lake and stream with Lakes Ladoga and Onega (see Fig. 102). Exactly the same is true of the eastern rivers. The Yenisei is but a few miles from the Ob tributaries, and the Chulym, a right-bank tributary of the Ob, approaches to within twenty miles of the Yenisei above Krasnoyarsk. The Yenisei, and especially its affluent the Lower Tunguska, leads close to the Lena system in the vicinity of Kirensk where there is a portage.

Deltas

Where the mouths of the rivers are in relatively tideless seas, deltas with numerous distributaries are produced. Probably the best example is

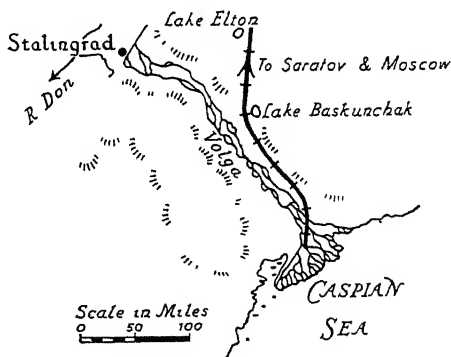


Fig. 16.—THE VOLGA DELTA.

Many of the large rivers of Russia have deltas. This is true of the Black Sea, Caspian and Baltic rivers and it is interesting to notice that the Arctic rivers east of the Yenisei are deltaic whilst to the west they have estuaries.

the Volga, and among the northern rivers are the Lena and Yana. There is also the Amu-Darya flowing into the Aral Sea and, finally, the Don whose outlet is in the Sea of Azov¹

Sand-spits

When the rivers laden with silt and mud discharge their debris into the sea, it is usual for some of it to be carried away by tides and sea currents.

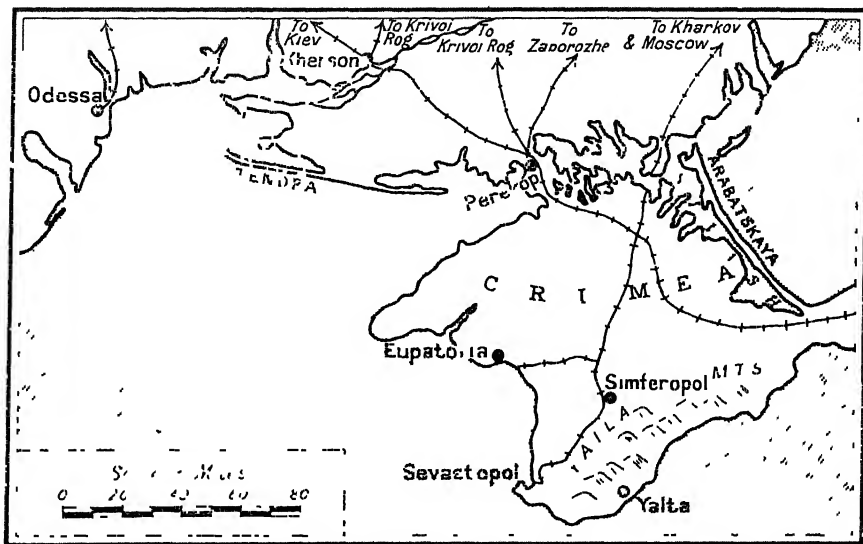


Fig 17 — SAND-SPITS ALONG THE NORTHERN BLACK SEA COAST

Much of the material brought down by the Dnieper and Don is formed into spits by the long-shore currents

However, should the tide be insufficient, long-shore currents redistribute the alluvium near the river's mouth in the form of *spits* and *long-shore bars*. The Tongue of Arabat to the north-east of the Crimea is a good example, and behind this there is the lagoonal area called the Putrid Sea or Sivash. Others are found along the shores of the Caspian, and lagoons form behind the bars, e.g. the Gulf of Kara-Bogaz.

¹ In this connection it is interesting to notice that the Arctic rivers west of the Taimyr Peninsula have estuaries but to the east they have deltas. This is partly due to tides and partly to earth-movement.

LANDSCAPE IN THE HOT DESERT REGION

Stretching from the mountains of Central Asia to the Caspian and Aral Sea region, there is a tract of country made of the repeating pattern of desert land-forms. If one were dropped by parachute in this area, it would be difficult to know from the scenery alone whether it was Arabia, Western Australia, South West Africa or even Colorado. The sandy deserts are called "Kum" in the U S S R. There is the Kara-Kum (or black sandy desert) between the Caspian and Amu-Darya, and the Kizil-Kum (or red sandy desert) between the Amu- and Syr-Darya. These form just a portion of the large desert belt which extends from the Sahara to Mongolia.

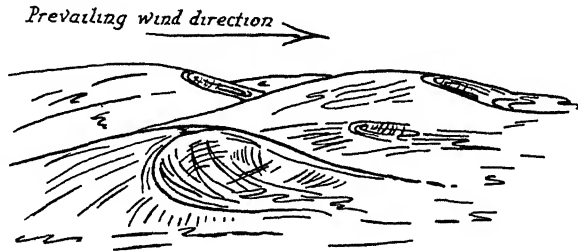
The main units of this desert landscape are:

1 Dunes

Many areas are occupied by a sea of sand blown into dunes by the wind, which always seems to be present. Often the dunes are crescentic with a gentle slope facing the wind and a hollow, concave slope on the leeward side. This type of dune is called a "barkhan" (see Fig 18).

Fig 18
THE FORMATION OF
BARKHANS

Such crescentic sand-dunes are typical of the sandy deserts in the world and they tend to move downwind.



Dunes are for ever in a state of movement downwind, and often encroach on a fertile oasis. Man has retarded this natural process by planting drought-resisting grasses and bushes to "fix" the dunes. Often the finer dust is carried for miles and then deposited. At the foot of the mountains there are many square miles covered to a depth of scores of feet by this fine wind-blown dust, called *loess*.

2 Loess

Loess fills up the irregularities of the floor, and when a road or river cuts its way through it, slight vertical joints can be seen. The rock is quite soft and porous, and stands up with a steep vertical face in this dry climate. Often houses have been excavated into the cliff side, just as in the great loess region of North China. Loess is neither restricted to the foothills of Central Asia, nor has it been formed during recent times. The steppelands of the Ukraine and the Volga region owe much of their fertility to the spreads of loess which date back from the period of the Ice Age. As we



Plate 5 —THE KARA-KUM SANDY DESERT

Large areas of Soviet Central Asia are covered with this type of desert landscape. Attempts are being made to fix the *barkhans* with drought-resisting tamarisk, saxaul and grasses. The flowering plant in the foreground is *Eremurus*.

have seen there were wide areas in front of the ice-sheet covered with fluvio-glacial deposits of sand and gravel. Many of the finer particles from these were picked up by the strong winds which always flow from the centre of an ice-sheet, just like the out-blowing polar winds to-day.

3. *Alluvial Fans or Cones*

The southern part of the desert region is girdled by the mountain rim on the borders of Persia and Afghanistan. The rocks of these mountains are weakened by the continuous process of freezing and thawing, and by the expansion and contraction of the small mineral particles comprising the rocks. Many of the rock fragments fall down the rock slopes under gravity, or are carried away by the raging streams fed by the melting snows. Even when there is no permanent stream, the rock fragments pile up in heaps whenever a change of slope occurs. This is most pronounced where the mountains meet the plain, and the resultant cone-shaped heaps are called *screes* or *talus*.



Plate 6—THE CLAY DESERT

This shows a barren, grey expanse of clay with a lonely camel-trail leading into the distance. After a period of rain, which occurs occasionally, quite extensive lakes appear. These dry out leaving behind glistening soluble salts and the mud becomes broken by polygonal sun-cracks. The wet clay contracts as it loses moisture by evaporation.

When a stream is unable to carry the rock debris any further it spreads out its load on the plain in a kind of fan-shaped delta. The mountain stream breaks up into a number of smaller distributaries which are progressively pushed forward into the plain. The terms *alluvial fan*, or *cone*, are sometimes used for these features. The streams often lose themselves amid this waste of rock debris; but since water is always present at no great depth near the alluvial fans, they are frequently the sites of oases (see Fig. 140).

4. *Wind Hollows*

As in other desert regions, hollows occur which make the surface of the land irregular and undulating. These vary from a few yards in length to one which is known to be eighteen miles by five miles in size. These are excavated, and resemble cauldrons, in the sand. The name for them in this region is "takyr." Occasionally temporary lakes occupy such areas and the clay-lined bottom can support some vegetation. It was formerly thought that wind was the sole cause of these phenomena but actual sinking of the rocks along a line of faults cannot be entirely discounted. Again,

as the underground rocks are often limestones, actual solution of the rocks followed later by subsidence may also contribute to their formation

5. *Buttes*

The work of wind as an eroding agent is well known in the arid regions of the U.S.S.R. Telegraph wires have their thickness reduced by half in a very short time. Rocks are often left as isolated peaks, and sometimes sculptured into fantastic shapes. The German term "inselberge" (island mountain) most aptly describes these individual hills. The other common name for them is *butte*.

These are the features which give the desert landscape of the U.S.S.R. its characteristic appearance. There is little that is unique. It is just the assemblage of land-forms which is typical of the hot sandy deserts of the world.

To conclude; the various physical regions of the U.S.S.R. can be summarised in brief as:

1. *The Karelo-Finnish Area and Kola Peninsula*

This is part of the Baltic Shield consisting of hard, resistant rocks. Originally the region was glaciated and left bare with striated rock-surfaces and many lakes. It is a most important mineral-bearing region.

2. *The Baltic and North Russian Plain*

This is a relatively flat plain developed on rocks of several types. The whole region has been covered with glacial deposits, boulder clay, sands or gravels, in the form of moraines, drumlins or eskers. Lakes abound in the irregularities of the surface, or behind moraines. There is plenty of surface water and the river pattern is a close network, like the veins of a leaf. As a result, it is usual to call such a drainage pattern dendritic.

3. *The Dnieper Lowland*

This triangular shaped lowland between the Carpathian foothills and the Central Russian Plateau, is drained mainly by the Dnieper, Pripet and Desna. The northern part is covered with glacial sands. The rivers have a gentle gradient and develop meanders, ox-bow lakes and braided channels. There are several marshy tracts, the most notable of which is to be found in the Pripet area on the site of an old glacial lake, and at the confluence of the Desna and Dnieper.

4. *The Central Russian Plateau*

This plateau stretches from the Valdai Hills, north-west of Moscow, to the Donetz valley. It is composed of rocks of various ages. Many of the minor river valleys are deeply incised, e.g. Upper Oka, Seim, Sosna and Oskol. In the south, a number of dry valleys with steep sides (ovraghi)



Fig. 19.—A PHYSIOGRAPHIC DIAGRAM SHOWING THE LANDSCAPE AT A GLANCE

This attempts to show the actual landscape types and should be compared with an ordinary atlas map of the relief. Notice the Baltic Shield of Finland and the Kola Peninsula, the moraine ridges across Northern Europe, the plateaux and scarps of South-West Russia and the plateaux and ranges of Siberia and Central Asia.



Plate 7 —PRIPET MARSHES, WHITE RUSSIA.

There are some 8000 square miles of bog and marsh in the Pripet basin which eventually flows into the Dnieper. It represents an old lake region dating from the Ice Age. Much of the area is covered with forest, lake and fen. On the drier patches fir and beeches can grow. When drained the soil is quite productive.

are present. The Don has its right bank higher than its left. The south part of the region has wide expanses of limestone and chalk country and therefore tends to be drier.

5. The Oka-Don Plain

This region with abundant surface water, is a contrast to the relatively drier and higher plateaux on either side. It was occupied by a lobe of the ice-sheet as far south as Pavlovsk. The watershed between the rivers Don and Oka is quite insignificant.

6 The Volga Plateau

The edge of this stretches away eastwards into the distance, along the right bank of the Volga from the neighbourhood of Gorki. It then turns south to Stalingrad. Beyond this town the feature continues as a north-south escarpment called the Ergheni Hills. The plateau country is made up of sandstone, clay and chalk and was for the most part unglaciated. An offshoot of the plateau forms the Dzhiguli Heights near the peculiar bend in the Volga at Kuibyshev. Incidentally this area is on the site of an east



Plate 8 —WEST SIBERIAN PLAIN

There are still wide expanses of natural steppe in Western Siberia, but they are gradually becoming grainlands like the Ukraine. The chief occupation is pastoral farming. As for the cowboy, so with the Russian equivalent, the horse is necessary for rounding up the stock. In the foreground a monument of prehistoric times is visible. This may date from about 1000 B.C.

to west upfold of the rocks. The Volga tributaries, the Sura and Syzran, are deeply etched in the edge of the plateau. There are a few small streams draining to the east but the main drainage is westwards into the Oka and Don.

7. The Urals

This north to south range represents a folded platform composed of limestone and crystalline rocks, and is a middle-aged mountain mass (Hercynian). The relief features are usually rounded and mature. There is an easy gap east of Molotov (Perm). The peak called Yaman Tau in the south reaches 5395 feet, so some of the region is quite high. Nevertheless, the Urals have never been a great physical obstacle. The Timan Range is an offshoot to the north-west. The northern part was glaciated. In the south the Urals are wider, and finally they disappear below younger rocks. There are many mineral veins which are associated with the intrusion of igneous rock-masses.

8 *The Kazakh Uplands*

To the north of Lake Balkash a massif, or plateau of old hard rocks, is exposed and the granite area of Kızıl Rai reaches 4821 feet. Coal rocks, but slightly disturbed, are found associated with these older rocks near Karaganda. This belt of high ground acts as a watershed and streams drain northwards into the Ishim and Irtysh and other tributaries of the Ob, whilst to the south there is an area of inland drainage. The Ili flows into Lake Balkash and the Chu and other smaller streams just disappear in the dry Golodnaya Steppe.

9. *The Aralo-Caspian Plain*

This plain area is really an extension from the Southern Ukraine, and lies to the north of the Crimea, the Caucasus and the Central Asian ranges. The limestone plateau of Ust-Urt, with several pronounced escarpments, lies between the Caspian and Aral Seas. The sandy and clay deserts of Kizil-Kum and Kara-Kum are diversified by dunes, hollows, alluvial cones, or buttes and the whole provides a good example of a region of interior drainage (see Fig. 19).

10 *The West Siberian Plain*

A continuous plain stretches for a thousand miles from the Urals in the west to the Yenisei in the east. It largely consists of the drainage basin of the Ob, and the fact that it is five times the area of France gives some indication of its size. The Ob and Irtysh have high right banks and a braided course especially during periods of low water. Floods, made even worse by frozen sub-soil in this region, are prevalent during the thaw season. Large tracts are occupied by extensive peat-bogs and marsh which are impassable quagmires in summer.

11. *The Central Siberian Plateau*

The name Angaraland is sometimes applied to part of the plateau lying between the Yenisei and the Lena. Here are to be found the remnants of very old folded mountains chiefly composed of crystalline rocks. The three Tunguska rivers dissect the area into several distinct upland regions which reach over 3000 feet in some places. Recently an extensive coalfield (The Tungus) has been found in this region.

12. *The North Siberian Plain*

The plain narrows eastwards and is really an extension of Region 2. The rivers Khatanga, Anabara and Olenek, drain the area into the Arctic Ocean. There is one region, the Biranga Plateau on the Taimyr Peninsula, which is not a plain. It represents a block of ancient rocks and reaches about 2000 feet in some places.

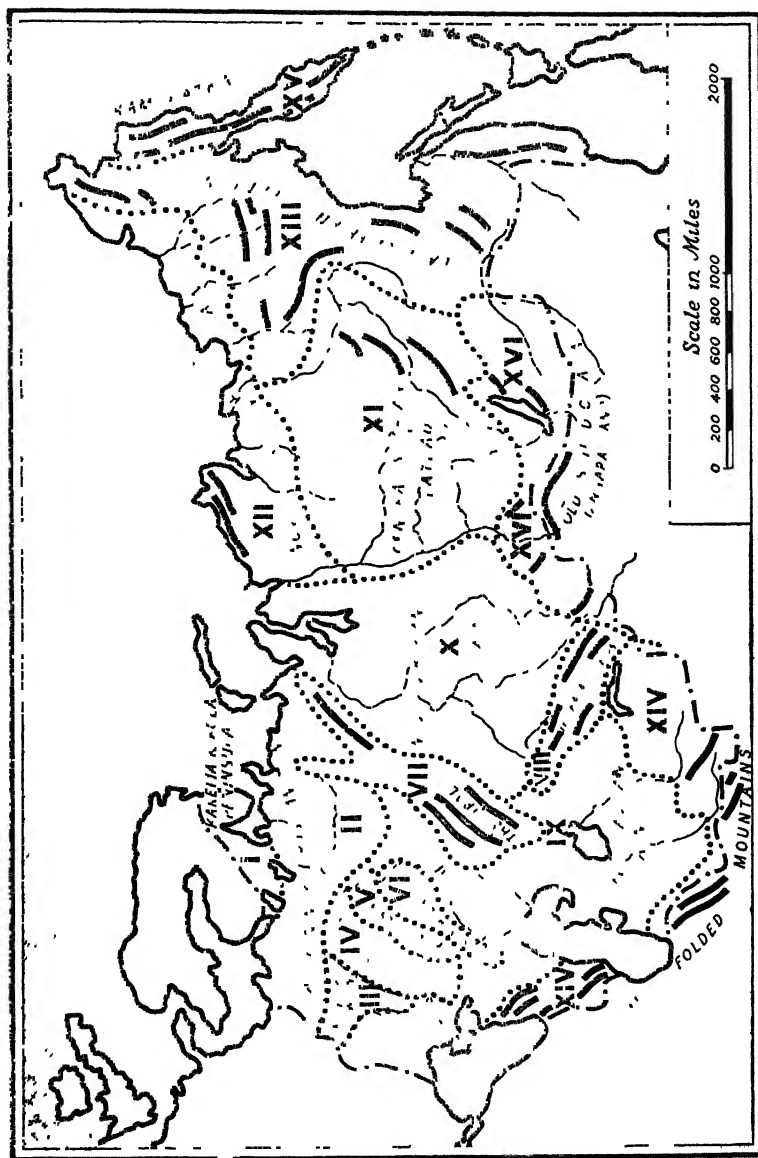


Fig. 20.—THE CHIEF PHYSICAL REGIONS.
Compare this with Fig. 19 and see whether these units are recognisable.

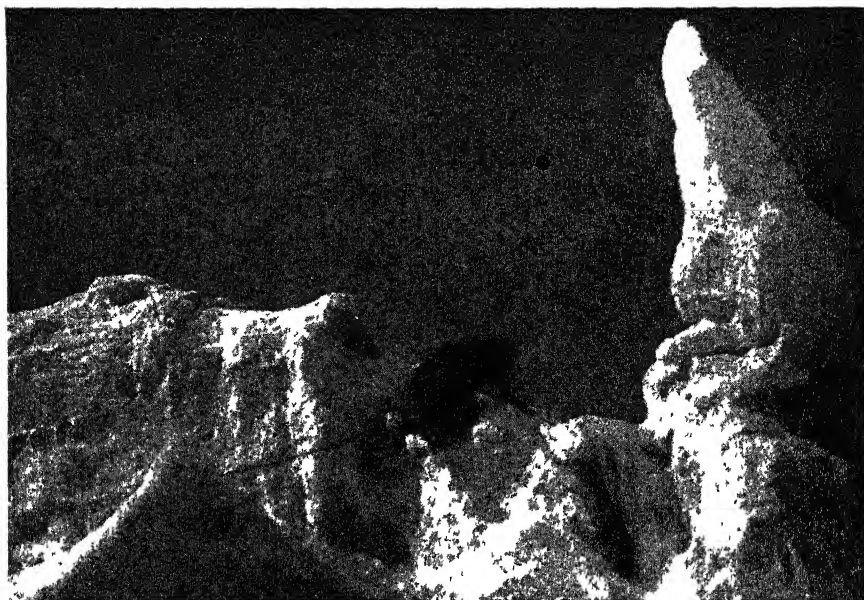


Plate 9 —THE PAMIRS

These ranges and plateaux rise to over 24,000 feet and form the southern boundary for some 250 miles between the U S S R and Afghanistan. The summits are in the land of perpetual snow and ice, in fact several glaciers have their origin there.

13 *The East Siberian Ranges*

These ranges have been folded at various ages and as a result the original rocks have been very much changed and crystalline rocks are prominent. There is evidence of glaciation in the morainic deposits left on the surface and there are several U-shaped valleys. The Stanovoi Range reaches over 6000 feet. The Tcherski Range was not explored in detail till 1926, when it was found in places to be over 9000 feet high.

14 *The Young Folded Ranges of the South-West Borderland*

These young folded mountains stretch through the Crimea, Caucasus, and into the Hissar Mountains and Tian-Shan. They are part of the belt extending from the Alps to Burma and beyond. It is in the Pamirs that the highest mountains of the Soviet Union are found. Stalin Peak is 24,590 feet high and Lenin Peak (Mt. Kaufman) 23,680 feet high. The land-forms typical of mountain glaciation are abundant and glaciers are still prominent on the Alai Tau and in the Caucasus. There are many steep escarpments as a result of movement along fracture lines. Tremors



Plate 10.—LAKE BAIKAL

The atlas map does not convey the size of this lake which measures 400 miles in length and is over 50 miles broad. It is the deepest in the world and contains a sufficient volume of water to maintain the flow of the Seine at Paris for over 500 centuries. Steep fault-line-scarps account for the precipitous shores.

are still frequent in many places and old volcanoes are to be found in the Caucasus, e.g. Elbrus (18,470 feet) and Kazbek. In this mountain environment it is the intermontane valleys which are most noticeable. Probably the best known, and largest, is the Ferghana Valley, an area of lowland which has foundered between parallel faults. It is drained westwards by the Syr-Darya.

15. *Kamchatka*

This region, consisting of altered rocks (metamorphic), represents an old peneplain which has subsequently been uplifted. More recently a period of volcanic activity ensued. Lava flows are found associated with the many cone-shaped volcanoes of the central or Vesuvius type. Some are still active and are perpetually emitting gases; others erupt at intervals both lava and ashes. Klyuchevskaya reaches 16,124 feet and is snow-capped. Hot springs and geysers are also associated with this volcanic zone which is really just a part of the Pacific "Ring of Fire." The general backbone of the peninsula is formed by the range of young fold mountains which continues southwards into the Kurile islands and Japan.

16 *The Old Ranges near Lake Baikal*

In the neighbourhood of Lake Baikal, there is a tract of country made up of rocks of many different ages and types. The higher parts comprise the Sayan Mountains, the Stanovoi and the Aldan plateau. This region has been subjected to erosion for long periods of time, later to be bodily uplifted. Lake Baikal itself is a region which has subsided between almost parallel fractures. It is extremely deep, over a mile (5712 feet) and measures 400 miles by 50 miles and is three hundred times the volume of Lake Geneva. Lake Baikal is essentially a rift-valley lake. Faulting has also been responsible for the massive plateau blocks like the Olekhma and Vitim Plateaux. These represent the complementary up-faulted massifs or *Horsts*.

Thus it is seen that all types of scenic features and rocks of various characters and ages are represented in the Soviet Union. As in other aspects, it is a country of great contrasts ranging from volcanoes 16,000 feet high to flat plains over 1000 miles wide ; from burning desert sands to frigid glaciers ; from the largest enclosed sheet of water in the world, the area of Sweden, to the smallest of lakes

CHAPTER III

CLIMATE

IN WINTER

IMAGINE the U S S R in winter¹. The first picture before the mind's eye is of wide, rather desolate plains covered with snow, frozen rivers, a biting wind and clear skies. This picture is broadly true, for none can forget the effect of a Russian winter on the German campaigns of 1941 and 1942, nor its effect on the retreat from Moscow of Napoleon in 1812.

The U S S R. is a vast unbroken land-mass and yet, despite its enormous size, the variety of weather and climates is not as great as might be expected. The fact is that there are no great physical and climatic barriers until the southern boundary formed by the plateaux and ranges of Central Asia is

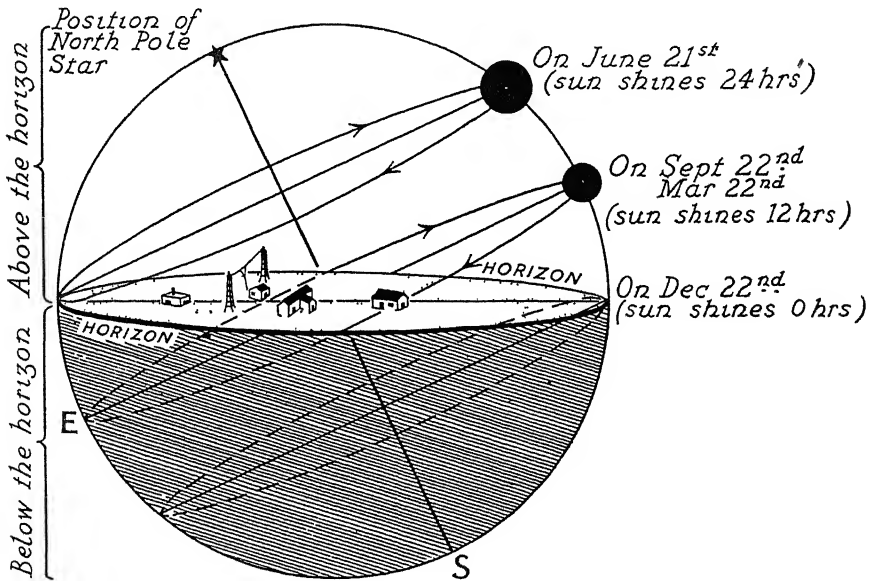


Fig 21 —THE PASSAGE OF THE SUN AT IGARKA, SITUATED ON THE LOWER YENISEI, 67° N

The top half of this diagram shows the actual sky above the heads of the people at Igarka whilst the shaded lower portion is not visible since it is below the horizon.

reached. In winter it is possible to go by sledge from Archangel to Astrakhan, and even eastwards to the Pacific Ocean. Thus uniform conditions prevail when once winter is established. Again, practically the whole country has an average January temperature well below freezing-point. Odessa in the latitude of Nantes in France has a winter as cold as that experienced in Stockholm.

The reason for the severity of winter conditions is that at this season the sun has little effect on air temperatures. In the extreme north, e.g. at Igarka, the sun is never seen above the horizon for part of the winter (Fig. 21). When it does appear, the rays are very oblique and therefore lacking in intensity. Throughout the winter, the land loses the heat it gained in the previous summer. As a result temperatures fall. However, the temperatures of winter do not vary from north to south as might be expected,

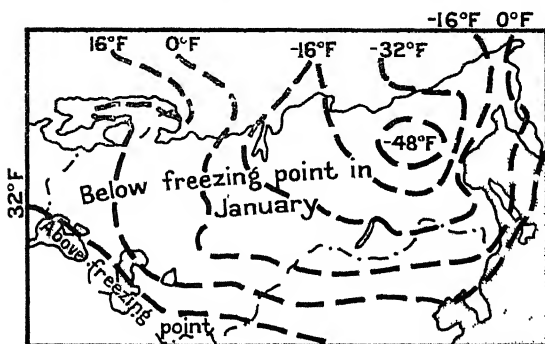


Fig. 22 — TEMPERATURE IN JANUARY (REDUCED TO SEA-LEVEL)

If the average temperatures are reduced to sea-level by allowing for the effect of varying altitude and then isotherms plotted, this map is obtained. Notice the "cold pole" in north-east Siberia and the fact that even on the average most of the U.S.S.R. has temperatures below 32° F in January.

but rather from west to east or more often south-west to north-east. For example, Taganrog, near Rostov, is as cold as Murmansk, and Fig. 29 shows that along the same latitude of about 60° N the winter temperatures progressively decrease further and further to the east until the "cold pole" is reached in the north-east of the country. This is so named because it is actually colder in January than the North Pole. Strangely enough, the temperature rises towards the Arctic Ocean and towards the shores of the Sea of Okhotsk, which shows that the sea does exert some slight influence. This progressive lowering of the winter temperature continues from the British Isles across Europe and at Verkhoyansk (Fig. 22) the temperature reaches a January average of -60° F.¹ This temperature is only the average temperature, so on many days it is even colder. In 1892, as a matter of fact, -90° F was recorded. If mercury were used in thermometers it would become solid, on the average, about 140 days in the year.

¹ It is thought that these extraordinarily low temperatures may be due to the drainage of cold air into the valley pockets. In fact, the higher plateaux may have even higher temperatures than the valleys, which is an abnormal condition.

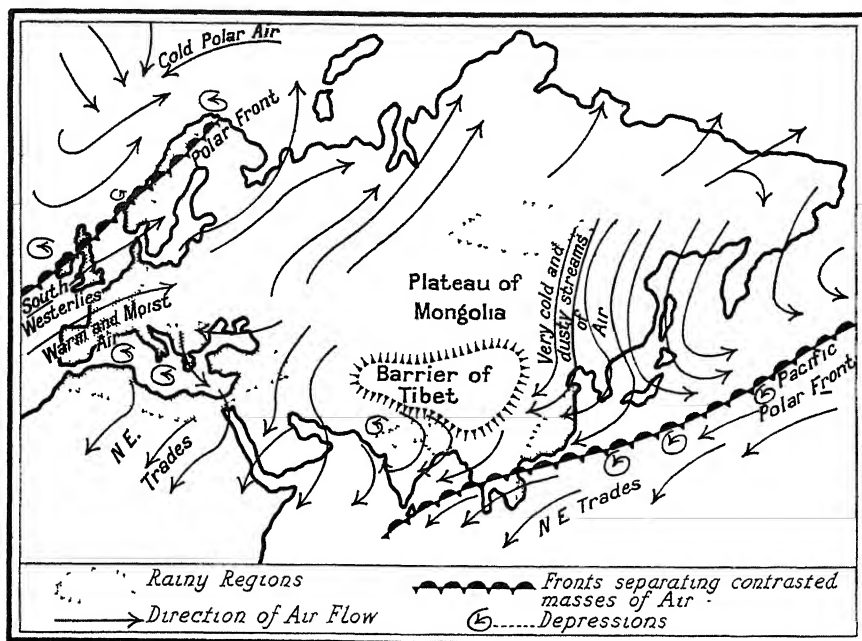


Fig 23 —THE GENERAL DIRECTION OF AIR-FLOW OVER EUROPE AND ASIA IN JANUARY

This also shows the *fronts* which separate the different masses of air and along which the *depressions* are generated. The major areas of winter rain are inserted, this rain being of cyclonic type.

The map of January isotherms (reduced to sea-level) shows that the further a place is from the Black Sea or the Atlantic Ocean the lower will be the temperatures. It is apparent, therefore, that the western oceans and seas, not the sun, are the main direct sources of heat in winter. The reason why nearness to the Pacific Ocean does not help to raise the winter temperatures is readily seen in Fig. 23. In winter, cold and dense air forms a centre of *higher*¹ pressure over north-east Siberia and, from this, air flows eastwards towards centres of *lower* pressure. Thus the air which moves over the eastern shores of the U.S.S.R. is off-shore, i.e. land-derived air. It is usually cold, dry and of low humidity, for air always reflects the conditions which obtain in its place of origin.

¹ Because of its high altitude the actual pressure observed at ground-level may be relatively low, but, when all average pressures are corrected for altitude differences, the pressure becomes relatively high.

WINTER

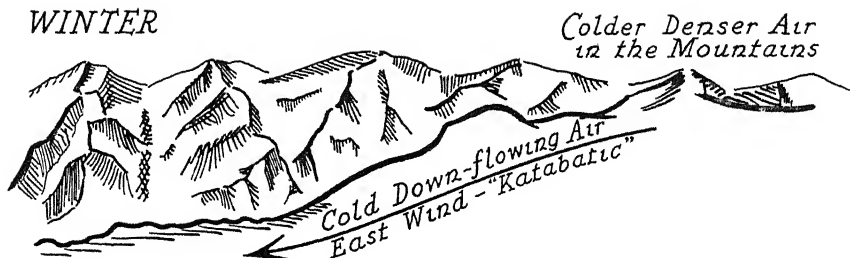


Fig 24 (a)

The drainage of cold air during winter months is experienced in the intermontane valleys of Central Asia

Locally, the cold heavy air drains from the lower plateaux of Central Asia just like water down a hill, and often in deep valleys like the Ferghana in Central Asia where there are high mountains all round, temperatures may fall quite suddenly as cold air sweeps down from the mountains. This is like the *Bora* of Italy, or the *Mistral* of the Rhône Valley.

Often cold air can be drawn towards the Black Sea if a *depression*, or low-pressure system, is situated there, and this type of weather may last for a few days. In England we call such spells "cold snaps," in America they are called "cold waves." Temperatures may fall 50° F. in twenty minutes under exceptional conditions, and a snowstorm, or *Buran*, may develop quite suddenly. These have even been known to stop trains. They are dreaded by man and often involve great loss of life to animals.

✓ There are many examples of the warming influence of seas and lakes. The Crimean "Riviera" is probably the best case in point, for the ameliorating effect of the Black Sea is aided by the east-to-west ridge of the Yaila mountains which run across the Crimea. These mountains protect the Crimean littoral from the cold north winds. A similar influence is also felt near Lake Baikal where the average December temperature by the side of the lake is 14° F., but seventy miles away it is -4° F. This is a similar condition to that found on the shores of the Great Lakes of North America. In both cases the moderating effect ceases to be noticeable when once the lakes are frozen. The Caspian Sea behaves in a like manner. In December the water is warm enough for a minor low-pressure area to develop over it and the wind blows from land to sea. In summer the conditions are reversed, the air over the Caspian is cooler, and therefore it becomes the site of a higher-pressure area. The winds then blow from sea to land. They are really "land and sea breezes." Similarly, when these conditions are magnified to a continental scale and put on a seasonal and not a daily basis, they produce the state of affairs which is found over Eurasia in January and July respectively (Figs 23 and 30). In summer

SUMMER



Fig 24 (b)

The warm rising valley winds of summer, especially in daytime, are a feature of the mountain districts

there is an indraught of air from sea to land and an out-flowing of air from land to sea in winter. This seasonal wind-reversal is called 'a monsoon effect'.

Before leaving winter conditions, it is necessary to notice that winter does differ in various parts of the Soviet Union. The main difference between places is in the actual *length* of the winter, which may vary from a few weeks in the south-west, to ten or eleven months on the Arctic seaboard.

The Freezing of Rivers

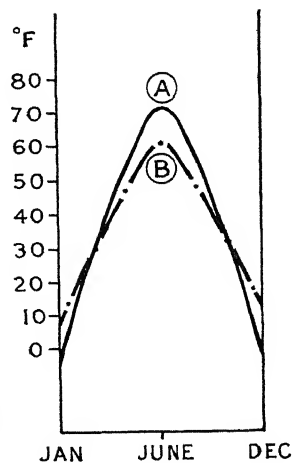
As the temperature is almost everywhere quite consistently below 32° F in January, all the Russian rivers, even the large ones, must freeze. It is

Fig 25 —TEMPERATURES NEAR LAKE BAIKAL

A, is a station 70 miles from the lake

B, is a station along the shore of Lake Baikal

This demonstrates the equalising effect on temperatures of large bodies of water. In summer the air over the lake heats up more slowly and in winter it cools down more slowly, whilst the air over the land behaves in the opposite way.



no small wonder, therefore, that the duration of frost is a most important factor in the life of the people, for a frozen river means there is no water transport available to them

Along the shores of the Arctic the river mouths are frozen for eight months, and over all Siberia for at least five months. Usually the air temperature is below freezing-point from ten to twenty days longer than the period the rivers are frozen. Keeping these facts in mind, it is possible to assess from Fig. 27 the average duration of cold weather and the average period that the rivers are open to transport. The moderating influence of the sea is again noticed ;— Murmansk is almost ice-free whilst Archangel is frozen for 140 days. This is due to the moderating influence of the North Atlantic Drift which does not penetrate the White Sea to any great extent. On the Black Sea coast, Odessa is frozen for seventy days since it is exposed to the cold north-east winds, but Yalta on the South Crimean Coast is ice-free. This gives some indication of the measure of protection afforded by the Yaila Mountains. The winters of Central Asia, though short, can be very harsh. The Pacific coast does not experience a very favourable climate. For example, Vladivostok harbour although in the latitude of Northern Spain is frozen for 110 days on the average every year. It is now kept open by ice-breakers.

IN SPRING

Spring is heralded by sudden jumps in temperature, which usually bring nice sunny days. But the transition from winter to summer may last for several weeks. A warm spring day is invariably followed by frost

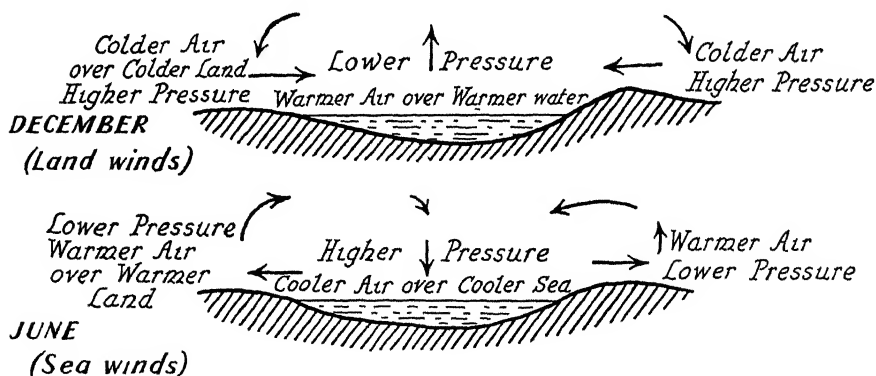


Fig. 26 —THE LOCAL WINDS OF THE CASPIAN SEA.

Because of the differing specific heats of land and water a system of land and sea breezes over an extended period is experienced near the Caspian Sea shores.



Plate 11 —THE VOLGA IN WINTER

Like all the other Russian rivers the Volga is ice-bound during the winter months. On the average, it is frozen for 172 days at Ulyanovsk, 165 days at Saratov, 148 days at Stalin-grad and even 109 days at Astrakhan. The high river bluff, so typical of the large rivers of Russia, is visible in the distance.

at night and April can be a snowy, cold month in all parts of the Soviet Union, with the exception of the Black Sea coast. When the spring sunshine arrives flowers and birds appear, but rapid thawing presents difficulties to transport. The thaw season, or *Raspoutitsa* as the Russians call it, is the time of the year when neither roads nor rivers can be used. Floods suddenly occur and are often disastrous. The north-flowing rivers in particular flood over thousands of acres, for their sources and middle courses thaw, whilst their outlets remain gripped in ice. Almost everywhere lakes and swamps abound; wheel traffic sinks axle-deep in mud, and makes deep ruts in the country roads. The thaw is quicker on fast-flowing rivers and when in spate they present a fine sight. The ice-blocks pile up and are hurled against bridges which have to be protected by wooden piers, and boats are placed in back-waters for safety during this period.

It is interesting to note that the air temperature does not rise rapidly until after the whole snow-cover has melted and the wet ground has dried.

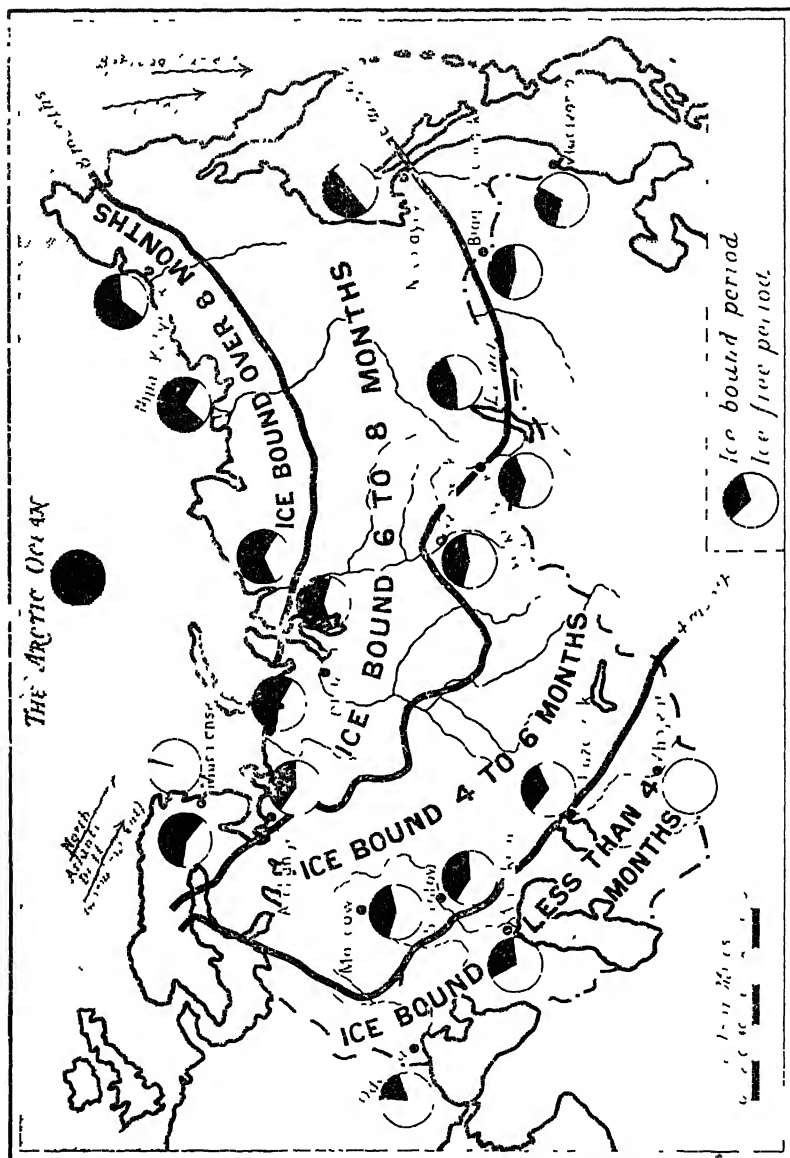


Fig. 27.—THE LENGTH OF TIME THE RIVERS ARE ICE-BOUND.

It is only in the extreme south that rivers remain unfrozen in the winter. Notice that it is only nearest to the western seas that helps to shorten the frozen period. The effect of the warm waters of the North Atlantic Drift is well seen at Murmansk.



Plate 12.—THE VOLGA, KAZAN

When the ice breaks up during the thaw season it is a menace to boats and bridges. Wooden shields are constructed in front of the bridge arches on the upstream side. It is done on most large rivers of Eastern Europe. The Kremlin of the old Tatar capital is visible in the background and demonstrates a commanding site. The bridge over the Volga used by the Moscow-Sverdlovsk Railway is half a mile in length.

a little. When once this has taken place the temperatures soar. Between March and April there is a rise of 15° F. at Moscow and 31° F. at Verkhoyansk, even in average temperatures. The last day of the thaw is a day for rejoicing and river craft immobilised through the long winter are once again seen on all the streams, lakes and rivers. The prospect of a good or bad harvest, too, depends upon the last night during which a killing frost is recorded, and should this be abnormally late, crops are likely to suffer. As a rule, if the depth of snow to be melted is great, then spring can be quite raw and cold, and summer slow in coming. Where there is little snow, spring is warm and pleasant, and soon gives place to finer summer-like weather.

IN SUMMER

It is not easy to determine exactly what is meant by summer. To give it some concrete meaning, the period when the average temperature is over

56° F. may be taken to represent summer conditions. By this definition London has four months summer (June to September). In comparison and using this criterion, Archangel has two months, Yalta in the Crimea, and Baku, six months each (May to October). However, in the east, north-east and central Siberia the length of summer is somewhat shorter, Tomsk has three months, Vladivostok three months and Verkhoyansk only one month. It is apparent that many places in the north and north-east of the U S S R. have short and cool summers, but nevertheless these are

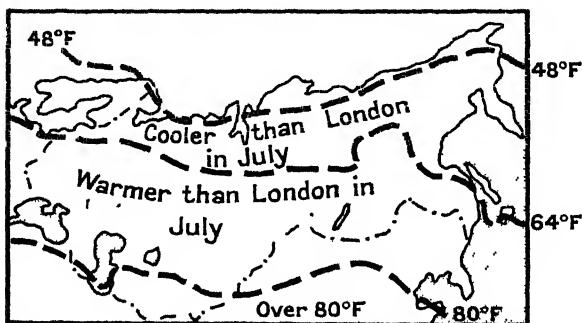


Fig 28
TEMPERATURE IN
JULY (SEA-LEVEL
ISOTHERMS).

In July the temperatures in the U S S R show a much more latitudinal direction. This is due to the fact that there is greater solar control in the summer.

very different from winter conditions. The long daylight-hours experienced in these high latitudes is some compensation for the low angle of the sun's rays even in summer.

The cool ocean currents to be found off Soviet Sakhalin, to the north of Japan, keep summer temperatures low, for here, in the latitude of the English South Coast, conditions compare with Archangel.

IN AUTUMN

Autumn is short in the north and north-east of the U S S R. Night frosts occur in August and soon afterwards navigation on the rivers comes to an end for another year. At this season of the year the Amur region has agreeable weather for the air is warm and of maritime origin. It is quite warm there till October and even as late as November in South Kamchatka, but the best autumn of all is found on the Crimean "Riviera." Here it is possible to bathe in October, and plant growth continues to the end of the year. Towards Moscow, on the other hand, frost appears quite early, and in September, although the day is quite hot and dry, the nights are cool and an overcoat is often welcome. The end of autumn is marked by another period of alternating frost and thaw which again makes movement most difficult.

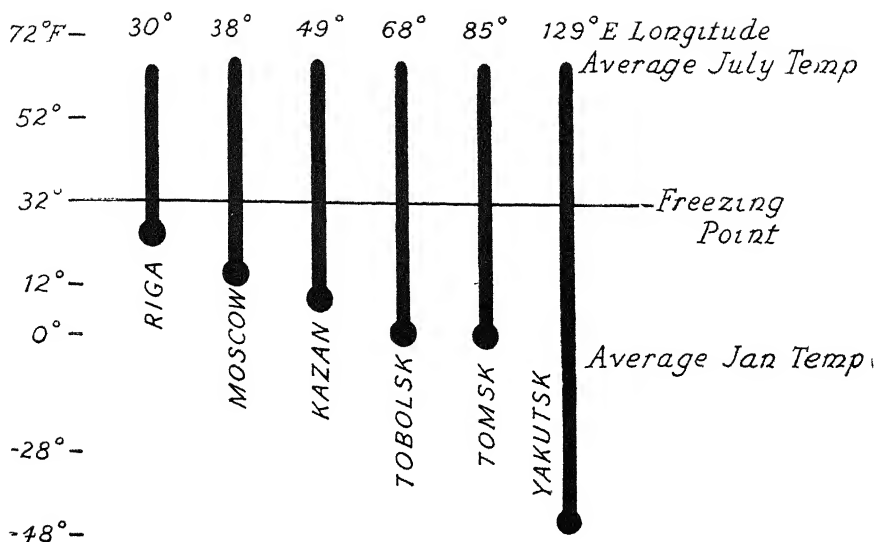


Fig 29 —THE INCREASE OF CONTINENTALITY TOWARDS THE EAST IN THE APPROXIMATE LATITUDE OF MOSCOW.

It is very clear that the greater range of eastern stations is due to a lowering of the January temperatures rather than a raising of the July temperatures.

Range of Temperature

U.S.S.R. is in the so-called "temperate" zone and it belies the name. The low winter temperatures which we have noted are anything but temperate. If, in addition, the difference between summer and winter temperatures is examined the extremity of the climate is made abundantly clear. This "extreme range of temperature," as it is called, becomes more marked in an easterly direction. Fig. 31 brings out this point by the lengthening of the temperature curves, whereas Fig. 29 shows that the extreme range is due to exceptionally low winter temperatures rather than to individual variations in summer temperatures. Regions with a great range of temperatures are said to have *extreme* or *continental* climates. Sometimes it is expressed as "continentality increasing eastwards." In this respect there is a close similarity between North America and the U.S.S.R. North America is the other comparable land-mass in "temperate" latitudes where similar physical processes are in operation.

Precipitation

The U.S.S.R. cannot be described as a rainy country. Few stations record more than 20 inches per annum (cf. London, 24 inches). The west and east have about 20 inches. The area between the Urals and the

River Amur has 15 inches or less. The Arctic shores have about 7 inches, and the region south of the Aral and Caspian Seas has 4 inches or less and is therefore a desert area. The only region of heavy rainfall is the eastern Black Sea coast (see Fig. 31).

Of far more interest and significance is not the quantity of rainfall, but rather the season during which the rain falls. The north-west and south-west of Soviet Russia have rain in winter and, as in Britain, this is brought by moist westerly air and by low-pressure systems or *depressions*. When, in addition, air of this type is forced over a mountain range as in the west Caucasus, even more moisture is precipitated. The mechanism is easily understood. When air is forced to rise, expansion takes place quite automatically. Expansion causes cooling and thus condensation occurs. Clouds form, and rainfall results.

If the temperature at which condensation occurs is below freezing-point, then the precipitation takes the form of snow. Although Fig. 23 shows that in winter the air is moving out of the U.S.S.R., storms do occur when depressions are able to penetrate some distance inland. Under such conditions heavy falls of snow are experienced. It must also be remembered that 1 inch of rain is equivalent to about 1 foot of snow. Thus where the air is moist thick falls of snow are found. The snow lies deepest in the forest region. Depths of 3 feet are quite common and drifts of even greater depth pile up. There are, however, large tracts south of the forests where no snow lies on the ground, owing to the fact that the strong northerly winds blow it away, and in the area round Lake Baikal and the Amur Valley it is often impossible to use a sledge.¹ These factors have an interesting reaction upon the vegetation. Trees give shelter, and under snow the soil temperature is usually maintained higher than the air temperature, for snow is a bad conductor of heat. The snow of the forest regions is not blown away, and when it melts in the spring, moisture is supplied to the trees. Not so in the grasslands; here the snow cover is very thin, or absent altogether. There is no shelter, and in spring there is no snow-melt. Therefore, the moisture in the steppe-lands is insufficient for tree growth and grassland is the natural vegetation cover. In the thin-snow regions and the Arctic shorelands, a permanently frozen level is present in the ground. This is called the *Merzlota* by the Russians. Wells have to be sunk right through this zone in order to supply the railways with water and, as this frozen condition renders the soil impermeable, the thaw-waters remain on the surface and floods and lakes abound (see below p. 62). As a general rule, the period during which most rain occurs is summer and late spring. Moscow has 11 inches at this period. This is true, in any case, of the whole steppe-land and forest region. The summer rains are in the form of violent and passing thunderstorms followed by dry, sunny intervals. It is usually

¹ Average number of days with snow are: Irkutsk, 27, Nerchinsk (Upper Amur), 9; Blagoveshchensk (Middle Amur), 9, Tomsk, 121, Moscow, 169.

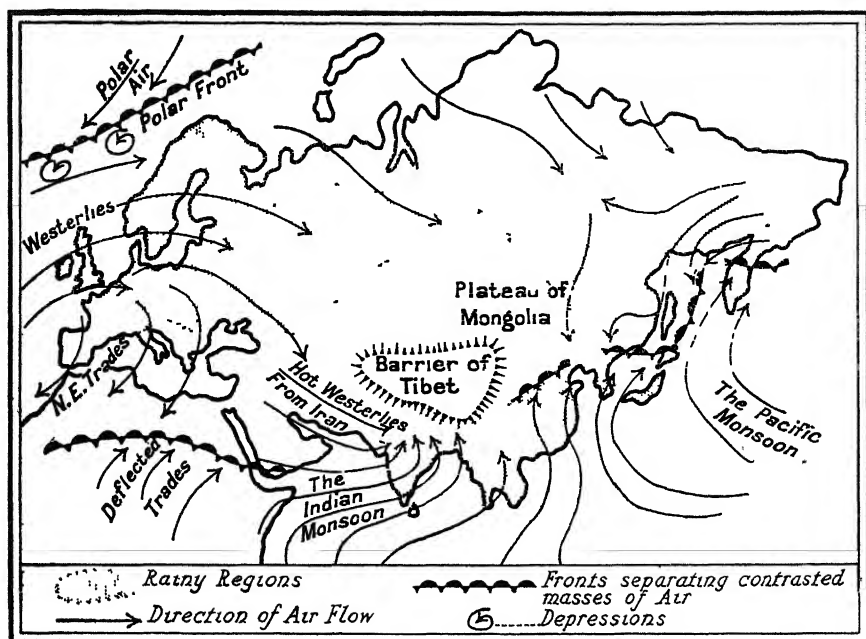


Fig 30.—THE GENERAL DIRECTION OF AIR-FLOW OVER EUROPE AND ASIA IN JULY

Both this and Fig 23 show that Tibet and Mongolia are physical and meteorological barriers separating the circulation of air into northerly and southerly systems. July is the period of light thundery rain across Northern Asia. The Pacific Monsoon brings rain to the eastern seaboard of the U.S.S.R.

called *convictional* or thunder rain and is caused by the rapid heating of the ground. The air above it is warmed and consequently rises, cools and gives rain. Convection is most active in spring when the rest of the atmosphere is still cold.

The rain of the east coast is due to the extension northwards of the summer monsoon of South-east Asia. The whole system of the North-east Trade Winds is reversed off the eastern seaboard of Asia and the air is drawn into the low-pressure centre over Central Asia because at this season the land in corresponding latitudes is much warmer than the sea. Thus moist easterly air moves from the cooler Pacific Ocean over the warmer land of eastern U.S.S.R.

Cloudiness

The amount of cloud in a region does affect the reactions of man, and determines whether it is a pleasant place in which to live. The west of

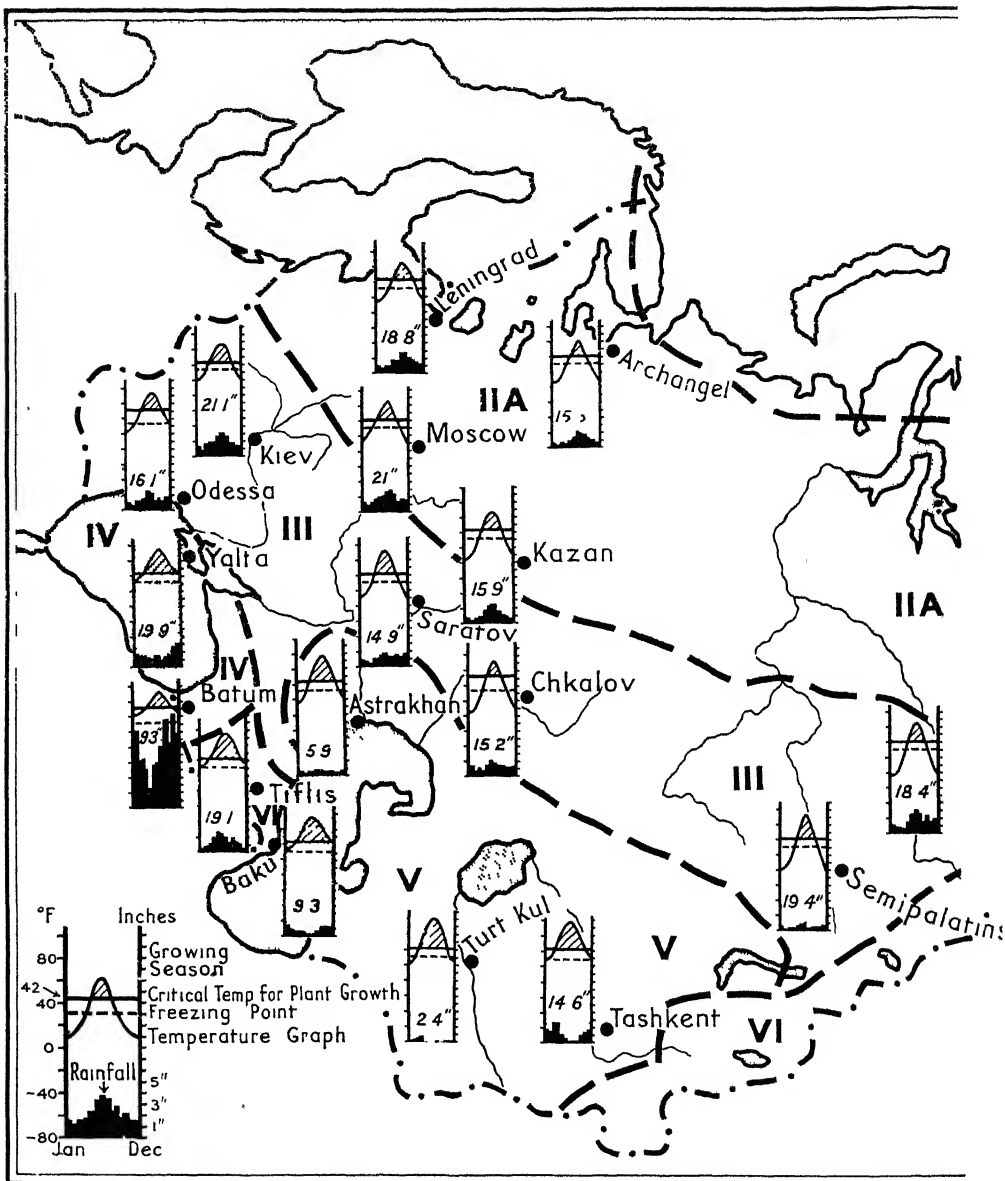
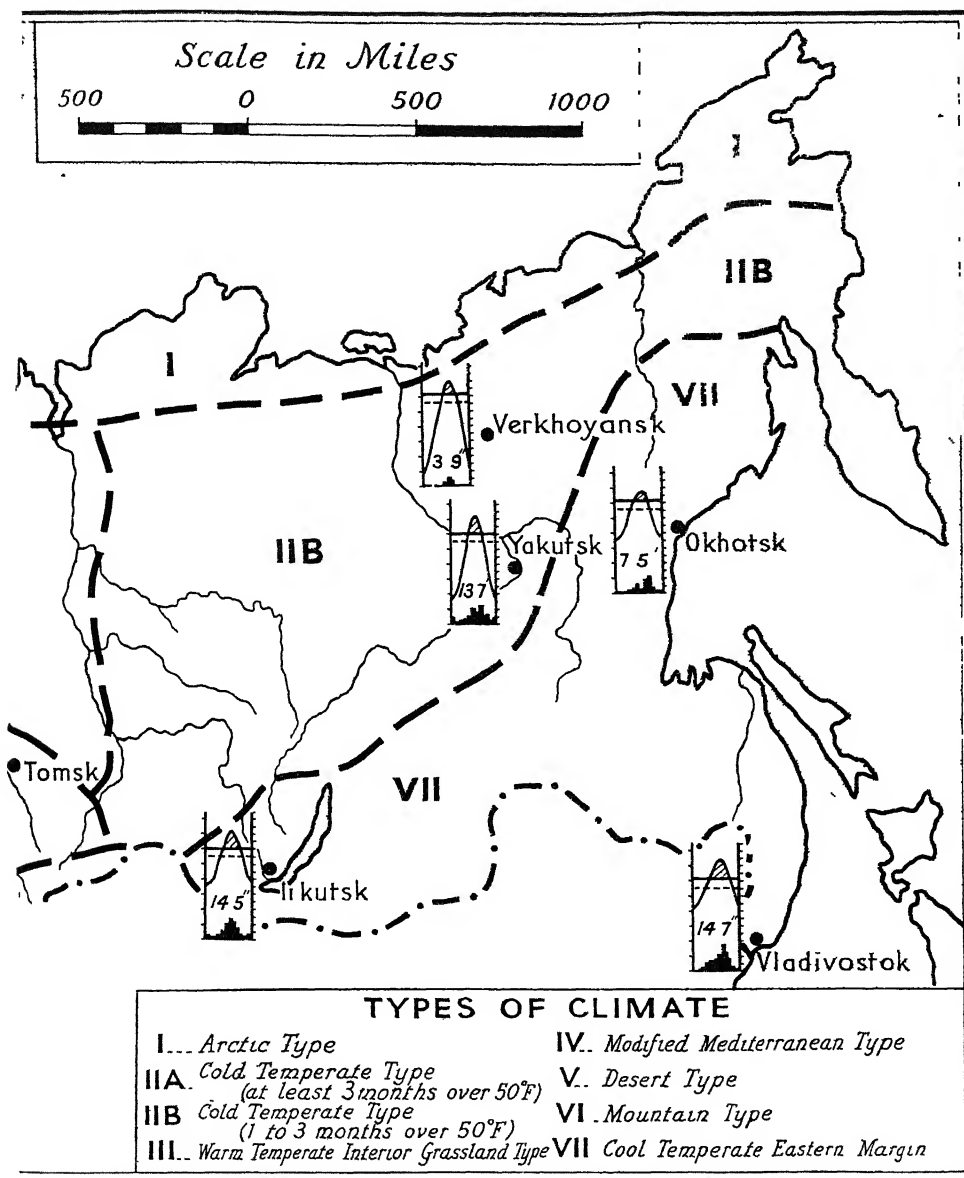


Fig. 31.—TEMPERATURE, RAINFALL, GROW-

On each graph the average monthly temperatures are shown as well as the average to see the length of the growing season and the period of the year when rivers are frozen Black Sea coast and Central Asia. Notice that the growing season becomes shorter



ING SEASONS AND TYPES OF CLIMATE.

monthly rainfall. Since the position of 32° F. and 42° F. are also included it is possible and snow lies on the ground. Most stations show summer maxima of rainfall, except the where the range of temperature is greater.

the U.S.S.R. is cloudiest in winter. Leningrad has about 39 cloudless days per annum and Astrakhan 91. It is the Lake Baikal region which has the blue skies by day, and the starry nights during which the aurora borealis is visible. Here 140 days are cloudless. Towards the Arctic, and the Sea of Okhotsk, clouds appear along with fogs and humid air. The Arctic Region has little precipitation, but spring and summer appear to be very wet because of the melting ice and snow. At this season the air is misty and humid, and the soil is in a state of flux. These "raw" weather conditions are most unpleasant. The air is moist but the temperatures only oscillate a few degrees around freezing-point. On the other hand, the very low temperatures of the "cold pole" region might seem unduly severe but they are surprisingly easy to withstand. This is because the human body finds dry air at a low temperature much easier to bear than humid air about 32° F, such as is experienced in this country.

In summer Central Asia has a hot, high-angle, noon-day sun shining out of a cloudless sky. The steppes are relatively cloudless, but the area of monsoon rain in the east has abundant cloud.

The climatic regions of the U.S.S.R. can be classified as follows (see Fig. 31).

1. *The Arctic Type (or Tundra)*

This is noted for its cool summers with long daylight hours of low-altitude sunshine. The winters are cold, with no daylight for part of the year. The ground is permanently frozen below the surface, and only thaws for one or two months. The actual precipitation is small but the air and ground are often damp during the short summer.

2. *The Cold Temperate Type (Coniferous Forest)*

The chief point to notice in winter is the decreasing temperatures in an easterly direction. In summer, the temperatures vary from 50° F. in the north to 70° F. in the south. The rainfall comes mainly in July and August in the form of heavy thunder showers.

In winter the snow cover is quite thick. There is a difference between (a) the western area which has a damper atmosphere in winter, and more precipitation in this half year, and (b) the eastern area which is a region with dry crisp air and permanently frozen ground.

3. *Warm Temperate Interior Grassland, or Turan Type. (The Steppes)*

The rainfall of the steppes varies in amount from about 10 to 15 inches, but the important point is not the amount, but whether the rainfall is available for plant-growth. The rain comes in spring and early summer when average temperatures are around 70° F. As a result, much of this summer rainfall is lost by evaporation. A further point is that thunder

rain is intense and tends to run-off rather than percolate into the soil. In winter the snow is thin, and frequently the strong northerly winds blow the remainder of the snow away.

4 *Modified Mediterranean Type of the Black Sea Riviera*

This is the mildest and most equable climate in the U.S.S.R. and winter temperatures are above 32° F. The summers are hot and sunny. However in winter rainfall totals of over 80 inches are quite common, especially on the eastern shores of the Black Sea, where the relief intensifies the rainfall.

5 *The Desert*

Here the rainfall is less than 8 inches. The winters are very cold (about 32° F.), and the summers very hot (over 80° F.). The sky is invariably cloudless, and the air is dry.

6. *The Mountain Type*

In the Caucasus and the Central Asian Ranges, the temperature is reduced in summer by the increased altitude. The aspect of the mountain slopes is most important and determines the amount of precipitation and length of sunshine hours. The winters are quite severe.

7 *Cool Temperate Eastern Margin Type. (Manchurian, or Labrador Type)*

The chief feature here is the humid air both in winter and summer. In winter, drizzle and fog are common and with the lower temperatures (below 32° F.) the air is "raw" and unpleasant. The winter winds blow strongly from the north-west and are dry and dusty. In summer the monsoon rain is quite heavy.

CHAPTER IV

THE SOIL AND VEGETATION COVER OF THE SOVIET UNION

AN account of the natural surroundings, or environment, of the U.S.S.R. is not complete without a study of the various types of soil, and the vegetation cover. The land-forms and the underlying attitude of the rocks are merely the bones of the skeleton and it is now necessary to examine the flesh and clothing.

A casual glance at Figs. 32 and 33 shows that there is a strong similarity between the distribution of the soil-types and the natural vegetation regions. This cannot be just an accident. As a matter of fact, both are influenced by the climate. The plants which can grow naturally in a certain region are dependent on the climate, and on the kind of soil. In addition, the soil itself depends both on the climate and the plants and organisms which develop both on it, and in it. This means that climate, soil and vegetation are all closely inter-related.

In Russia the soil-belts are well defined. Uniform types are found over wide areas, and because of the great extent of the country there is the chance for the development of contrasted soil-types. It is hardly strange, therefore, that Russian scientists should have been in the forefront of soil study right from the pioneering days.

In fact, the original Russian names for various soil-types are universally used to describe similar soils which exist in other parts of the world. The application of soil science, or pedology, and its bearing on agriculture are obvious and so Soviet scientists are still continuing to work in this most important field of science.

What is the Meaning of Soil?

Soil is the upper layer of the rocks which has been weathered. It consists of rock particles more or less changed by complete chemical action and by the effect of plant and animal life living in it and on it. Changes in temperature make the minute mineral particles of the rocks expand and contract at different rates, causing them to break up. If frost occurs, tiny cracks increase in size, the frost acting like a wedge. As is well known, when water turns to ice expansion takes place. Apart from these *mechanical* changes, other *chemical* changes occur. In a wet region, water soaks through these particles of varying composition; some are chemically altered to simpler substances—other substances are carried down in solution to lower layers in the soil and may be precipitated there. This solvent action of

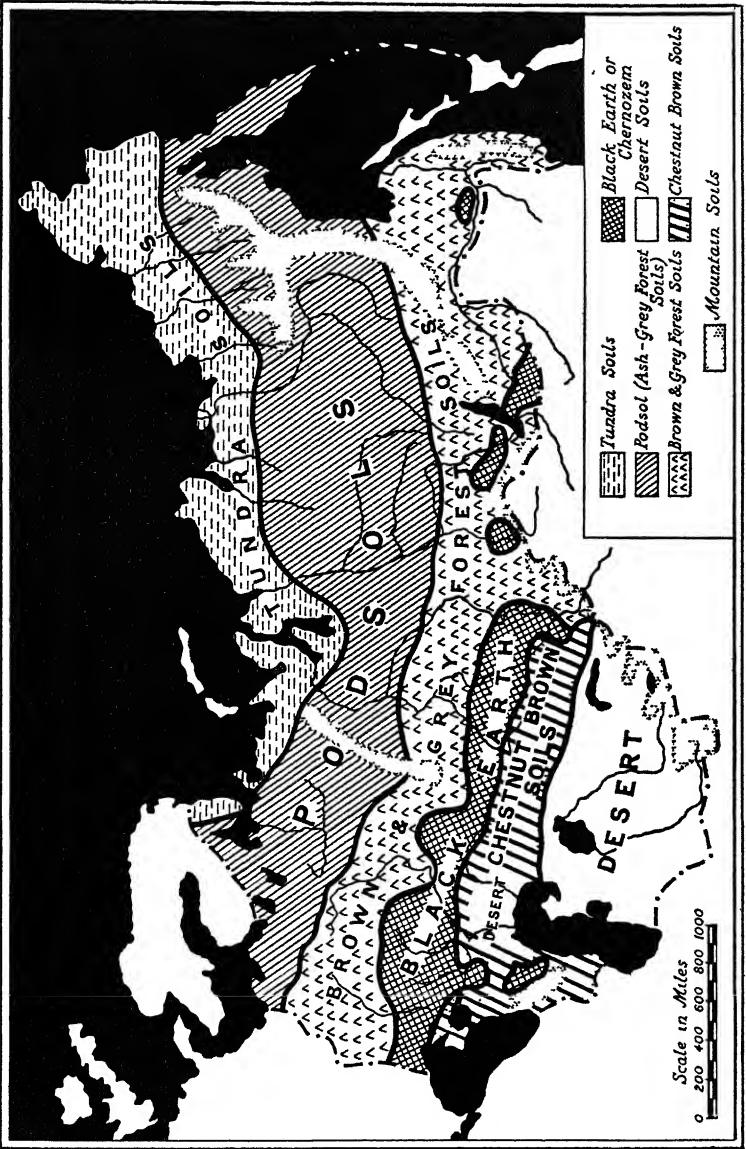


Fig. 32 —THE SOIL REGIONS.

There is a strong similarity between the pattern of this diagram and Fig. 33. Notice the higher temperatures of the south, the mountain barrier and the distance from the ocean and moisture-laden winds make Central Asia a desert. It also leads to the wedging out of the southerly soil regions in an easterly direction

This diagram shows the section or profile of the soil from ground-level to the top of the unaltered rock and everything in between is, properly speaking, the soil. In some regions the movement of soil waters is predominantly down, which leads to leaching of the upper "A" horizon, in others the soil waters with salts in solution move upwards and form saline soil.

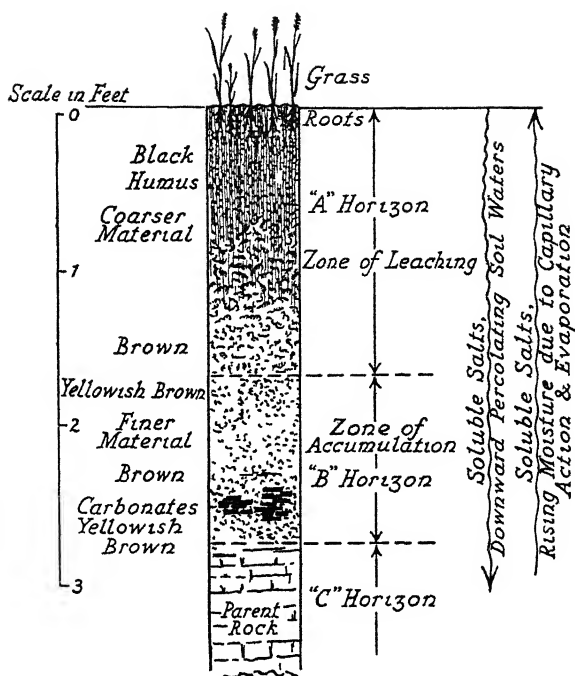


Fig. 34 —THE SOIL PROFILE OF THE BLACK EARTH OR CHERNOZEM

percolating water is increased by the addition of carbon dioxide from the air and soil which produces in fact a weak acid (H_2CO_3).

When plants which live in the soil, or on the soil, die, they eventually decompose. Gases are given off and a residue of black or brown decomposed vegetation is left behind. This is called *humus*, and it in turn may disappear, but the speed of the process depends upon the oxygen and water content of the soil as well as upon temperature. Decomposition is also helped by tiny organisms which are called *bacteria*.

It is these processes which form a soil peculiar to a certain climate. If any of these factors change, a complete cycle of changes takes place in the soil. Affect one of these factors by deliberate action, and all are affected. For example, trees influence the climate both above and in a soil. The air is damper and cooler under tree-growth. If any forests are cut down the soil becomes drier. Wind can then blow it away, for the roots of trees bind the soil particles together. After rain, streamlets may carry away much of the soil if it has no vegetation cover. Water with its soluble

compounds which previously moved upwards by root action, now moves downwards and the humus supply from fallen leaves is removed. Thus deforestation may have disastrous results. Such has been the case in many regions in the U.S.A., China and the U.S.S.R.

The soil expert can deduce the type of soil, and the changes that have taken place by the study of a soil section. This can often be seen in a trench, a railway cutting, or by the roadside. It is best if such a section goes from the surface to the bedrock. All this is soil and it is under the influence of the root action of plants. It may vary from a few inches in thickness to almost 15 feet and the correct term for it is the *soil profile*. A generalised section is seen in Fig. 34, which shows that the soil-water may move upwards, or downwards, carrying with it organic and inorganic substances. These are taken from A to B or from B to A. Of course, some of the substances help to make up the plant tissues, and are only to be given back to the earth when the plant dies or when the leaves fall. When the plants are removed as in most branches of agriculture, then the soil is depleted in fertility. Hence the need for the practice of manuring the soil.

THE MAIN SOIL AND VEGETATION ZONES ¹

1. *Arctic Soils and the Tundra*

The chief controls in this region are the low rainfall, the low evaporation, and the low temperatures. The summers are very short and even though there is daylight for twenty-four hours the subsoil is permanently frozen. Under such circumstances, chemical weathering is at a minimum but the surface becomes shattered and, when dry, smaller particles may fall down the cracks. As the result of freezing, stresses caused by expansion are set up and the soil becomes arched into drier rounded hillocks (see p. 62). Humus accumulates slowly above the frost-level and decays very slowly on account of the low temperatures.

The treeless Tundra is the frontier post of the plant world. Strong winds and frozen subsoil, together with the short summers and weak sunshine, make conditions inimical to tree growth. On the rocky and stony soil, reindeer-moss is found. It grows very slowly, probably about $\frac{1}{8}$ -inch in a year, and so the grazing of these areas has to be controlled with great care. In other areas, such as between the River Pechora and the Ural Mountains, stunted birch bushes and willow will grow almost knee-high.

The hollows have poorer drainage, and the swampy nature is increased by the impervious layer of frozen soil and by the formation of what is

¹ It must be remembered that cultivated soils tend to be similar to one another and approximate to brown and black earths. This classification applies to natural soils with their natural vegetation cover.

Plate 13
THE REINDEERS OF
THE TUNDRA.

These animals are still the most important to be found in this region. They live on the moss and small bushes and provide the people with transport, meat, hides and bone



called "pan" on sandier soils. Pan is more typical of drier regions and is the result of the precipitation of salts from solution at a definite level in the soil. A hard rock-band made of either calcium carbonate or an iron-pan of iron carbonate and hydrated oxides of iron may be formed in the soil. If water from the surface is supplied to this layer more quickly than it can percolate through it, saturation of the soil-pores occurs and the surface becomes waterlogged. In such areas as these, sphagnum moss and peat are the chief plants

On sunnier slopes the drabness of the Tundra is relieved in the short summer by the sudden appearance of poppies, saxifrages and other polar flowers. There are also certain areas with abundant grassy meadows which provide annual pastureland. Near by, patches of heath with berry-bearing plants can be seen and it is interesting to notice that many of the plants

are similar to those of the steppe and drier regions of the south. The roots of the plants find water very scarce and so the leaves are often leathery, waxy or woolly. This adaptation is an attempt to conserve any water which is available. It is seen that the Tundra is not a polar desert but rather a polar steppe-land. The animal life of this region includes the white fox, white partridge, the lemming, Arctic fox and, of course, the reindeer. In summer these animals move northwards alongside the flesh-eating animals of the forest, which prey on the gulls and wild duck. This migration is prompted by the appearance of the mosquitoes which breed in the waterlogged country in summer

2 *The Ash-grey Soils of the Coniferous Forest Belt*

The Russian scientists gave the name *podsol* to the ash-grey soils occurring south of the Tundra. This is the soil-type which coincides with the Coniferous Forest belt and Fig. 32 shows that it stretches across North Europe to the Pacific coast of the U.S.S.R. The main feature of this soil is an upper layer which consists of ash-grey coloured sandy particles. Nearly all the darker substances, like iron hydroxides and humus as well as the clay particles, have been carried down to the lower layers, and so under the light layer "A" there is found a darker layer composed of humus and iron compounds (cf. Fig. 34).

Thus it is seen that the main movement of the soil-water is downward and the soluble substances are taken from Zone A to Zone B. When this occurs, the upper soil-layers are said to be "leached." In fact, very little else is left in Zone A except sand grains for silica is not easily attacked by soil acids. This helps to make the soil acid, a condition which is increased by the accumulation of pine needles.

It may seem surprising that so much of the plant-food should be taken from the surface soil in a region of relatively light rainfall. However, it must be remembered that there is very little evaporation in this region. The air temperatures are below 32° F. for over six months and the trees help to maintain fairly low soil temperatures. In addition, the melting of the snows in spring has the same effect as quite a heavy rainfall.

The natural vegetation of the podsol region is the Coniferous Forest, or *Taiga*, as it is called in Siberia. On its northern fringe there is no clear-cut boundary. At first the birch and the conifers such as pine, fir, spruce and larch, are dwarfed, gnarled and stunted. The trees only begin to flourish where the snow is thicker and the winds less strong. In the south, the firs, spruces and larches mix with oak which reaches as far north as South Finland, Leningrad and Molotov (Perm). The types of tree vary from west to east but the difference between the several kinds of pine and fir is not great.

In certain sandy areas the soil is strangely waterlogged. This is not



Plate. 14.—WINTER ON THE EDGE OF THE CONIFEROUS FOREST

Southwards the Tundra merges gradually with the forest or *taiga*. Alongside fir and pine, birch is to be found and is sometimes the chief tree. In winter, lumbering and trapping are the main activities of man, many animals hibernate, but the tracks of one are visible in the picture. These help the trapper.

quite expected. The reason for it is that a hard iron-pan has formed in Zone B, and this layer prevents further downward percolation of water. The plant cover reacts to this, trees do not thrive and their place is taken by peat-bog which has proved a most useful source of fuel and has even been used as a source of iron ore in the area near Archangel. In these bogs bacteria of the type which can secrete iron compounds often develop. The deposits are sometimes referred to as *bog iron ores*.

The wide stretches of peat-bog confronted the engineers with a serious obstacle during the construction of the Moscow-Leningrad railway just as their counterpart, the Muskeg swamps, did in the case of the Canadian Pacific Railway. The central part of the Ob Basin is another example of fen, or lowland peat accumulation on a large scale. This is called the Vasyugane Swamp.

The Eurasian Coniferous Forest is the most extensive in the world and it is quite easy to lose oneself in many parts of it. The conifers extend southwards, and reach and clothe the slopes of the mountain ranges in the south of the U.S.S.R. east of 80° E. longitude. They extend to about

2500 feet on the Aldan Plateau and on the Altai Range where they grow more dispersed and taller.

Along the southern borders of this belt west of 80° E. there is a transition zone of mixed coniferous and deciduous trees. Thickets of willow, birch, alder and poplar occur and, although generally there is little bush-growth under the trees, whortleberries or bilberries are found in some places. Just as the Canadian forests have been depleted by terrible fires, so similar misfortunes have occurred in large areas of the Taiga. However, the burnt, gaunt-looking areas are soon colonised by new plants, and birch is usually the first tree to make a home there.

Animal life is more varied than in the Tundra. There are the animals which live on berries and these in turn provide food for the birds of prey and the carnivorous animals. The wolf, lynx and the fox are natives of this zone, in addition to the marten and ermine. Just as it is impossible to draw a definite line between the soil and vegetation zones, so too the animals move from one area to another. Reindeer come into the forest and the pelicans and herons of the Lower Volga go as far north as the headwaters at Yaroslavl.

The Permanently Frozen Souls of Siberia

Under the greater part of Siberia whether the surface is covered with tundra, taiga or even steppe, there is, at no great depth, a layer of frozen ground with ice filling all the pore-spaces in the soil and rocks. It is found in the lower Ob basin, and even the shorter Siberian rivers like the Indigirka and Kolyma in the north-east, flow along a bed of ice in both winter and summer. The ground has been found to be frozen to a depth of over 1700 feet at Kozhevnikov Bay in Northern Yakutia. However, it is not as thick as this everywhere. This region of frozen subsoil has been known for many years since it could not fail to be noticed by railway engineers. The farmer's spade rings as it strikes the frozen ground.

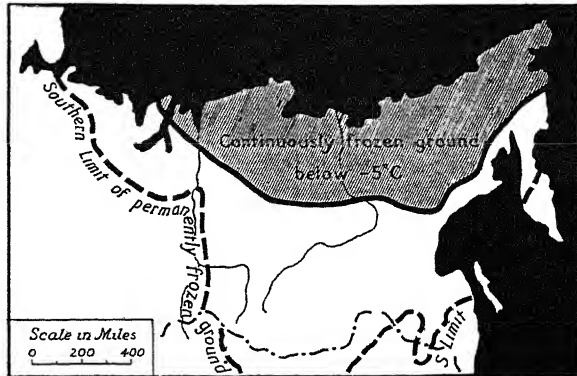
With recent developments of mining, building and farming an *Institute for the Study of Frozen Soil* was set up in the U.S.S.R. in 1930 for the planned study of all connected problems. It is now named after the Soviet geologist Obruchev,¹ who has written a most graphic account of the amazing effects to be seen in this region. Incidentally, this area must have a counterpart in Northern Canada.

In the Tundra the ground surface is sometimes domed up by the pressure of underground circulating water, which is unable to escape normally as a spring because it is imprisoned beneath a thick layer of frozen soil. In some cases the dome of frozen soil explodes and may hurl blocks of earth the size of a house in all directions. It was noticed that many of these hummocks occurred near roads. The reason was found to

¹ Eternally Frozen Soil. V. Obruchev. *Soviet War News*, 1037-1040.

Fig. 35
THE AREA WITH A
PERMANENTLY FROZEN
SUBSOIL

Certain areas in the north-east of the U.S.S.R. have subsoils which have never thawed out since the period of the Great Ice Age



be that a road is a good radiator of earth-heat, and allows the frost to penetrate to a greater depth underneath. In this way, a kind of frozen wall under the road acts as a dam to the circulation of underground water. The water, much compressed, ultimately bursts through the hummock and covers the road with a great mass of ice. It has been found that if a ditch is excavated parallel to the road and some distance from it, the same hummocks are produced for the same reasons, but the road is protected

When the railway was being constructed near Lake Baikal buildings and houses were erected. These of course tend to keep the ground under the floor relatively warm. Thus thawing took place. Walls and foundations moved and eventually the buildings collapsed. In some other cases the plight of wooden houses was even worse, for when the frozen subsoil was thawed the water so released was under pressure, and it has been known to rise through the floor and fill the house, flowing through the windows in cascades which soon froze (see Fig. 36). In some of the new towns the houses are built on insulated rafts, or piles, and then they have good foundations on the frozen subsoil. In other cases it is advisable to allow the soil to thaw out before building.



Fig 36.

In the land of the permanently frozen subsoil the ground under these houses has melted, risen through the floor and frozen as it poured through the windows

It can readily be seen that when cellars are dug in the frozen soil they form perfect refrigerators. They are used to store potatoes and vegetables. The ice-cellars can have their temperatures kept about 1°C below zero. To prevent the walls from melting away they are insulated by sawdust, moss or even pine needles.

Mining operations are likewise helped ; in fact coal can be blasted out by explosives and the roof remains quite firm without the aid of numerous props along the mine galleries.

Agriculture is practised in many places (see p. 170), and it is possible to grow tomatoes where oats formerly failed. The active soil may be six inches or over a foot in thickness and even though the Arctic and North-east Siberia has little precipitation, the soil remains moist. The reason for this is that the frozen layer acts as an impervious bed and the water does not soak away to leave the soil dry and a virtual desert. Thus it is seen that it would not necessarily be a good thing if the frozen soil completely thawed out. As a matter of fact, the area is slowly retreating at Mezen, north-east of Archangel, at the rate of a little over half a mile per year. There seems little doubt that this frozen soil is a relic of the last Ice Age.

It is interesting to notice how the moss of the Tundra helps to maintain the frozen soil. The moss is usually wet with snow-melt or dew, and so in summer the sun-energy is used in evaporating the moisture, and not in thawing the ground. In winter the moss and ground are frozen and earth-heat is allowed to escape, for the frozen moss acts as a better conductor of heat. In order to increase the thickness of the active soil, the first task is to strip off the Tundra mosses and lichens.

Finally, if the ice-cellars can preserve vegetables, there is no reason why, when humans and animals are buried in the frozen layer, they should not be preserved for centuries. Decomposition would be arrested. This may be an eerie thought but it is allowing much progress to be made with the study of the ancient peoples who lived in this area. Mammoths, now extinct animals, have also been found. In fact, some were so well preserved that their flesh could be eaten even though it was thousands of years old ! Much is now known, but there are many unsolved problems. Trees are able to grow, as we have seen, for the conifers spread their roots quite horizontally. This makes them unstable in gales and accounts for the many fallen trunks and the absence of such trees in areas where strong winds are common. However, this most interesting region stretches from the Arctic Tundra to the forests and grasslands of the Amur valley and this layer of frozen soil underlies several vegetation belts.

3. *The Brown and Grey Forest Soils of the Mixed Forest Belt*

This is essentially a zone of change from the true forest to the steppe, and from the podsol to the Black Earth regions. It is also an area which has been modified by the activities of man. But sufficient natural areas remain unaffected so that it is possible to estimate the general conditions which man would have found on his arrival. This soil-region is only found in certain areas, e.g. in the region west of the Urals, and in the Lower Amur and Ussuri valleys. It does not stretch right across the U.S.S.R. Where the conifers are found, the soil is grey, sandy and deficient in lime, in fact



Plate 15.—AIR SURVEY SHOWING CUTTING AND REAFFORESTATION.

This aerial photograph shows that trees have been cut in rows. Those remaining act as shelter-belts for the young, new trees which soon grow by natural seeding. Later the larger trees will be cut. To prevent soil erosion the trees are cut at right angles to the slope of the valley and are left near the meandering river. In 1946 nearly four million acres of forests were surveyed from the air in the U S S R.

weakly podsolised. These tracts of grey soils are often found on sandy deposits left by the ice-sheets. The deciduous trees are of few species, and groups of a single kind are common. Oak, birch, poplar and alder are found, with willow fringing the watercourses. In winter the activity of these trees is at a minimum, and leaves are shed only when the temperature falls. Water is scarce but thick bark and scaly buds conserve supplies and

protect the trees in the cold weather. These trees adapt themselves in one way, the conifers in another. In both cases growth is very much slowed down in the Russian winter when water and sunlight are missing.

The leaves of the deciduous trees are not so acid as pine needles, and humus is able to accumulate and so helps to darken the soil. The darker brown colour is also partly due to the presence of iron hydroxides. This region is rather drier, for in summer there is more evaporation and higher temperatures are found. Leaching of the upper layers is much reduced and as a result more of the clay particles remain. The soils of Britain fall into this broad category. Of course, when this broad belt is studied in more detail it is found that there are many variations of soil. These may depend on the underlying rocks, which may be clay, sandstone or limestone. The underlying geology can influence the soil if the climatic factors have not had time to complete their work or do not allow large-scale leaching or stimulate the action of bacteria. Such soils are then called "immature."

On the southern border the mixed forest passes into an area called the "wooded steppes," and thickets or "islands" of oak, birch and poplar are to be found along the river banks, separated by wide expanses of rolling grasslands. Further south this merges with the Black Earth Region.

4. *The Black Earth of the Steppes*

Probably the best-known soil-belt of the world is the Black Earth Region which stretches like a wedge from the Ukraine to Central Siberia. The Russian name "Chernozem" is often used for it. This zone is wider in the west, where it extends through 10° of latitude. The soil is deep black and loamy, whilst the individual particles are in the form of crumbs with plenty of air-spaces. The Black Earth is rich in many of the soluble substances which represent food for plants. It is a soil associated with a climate where the winter temperatures are well below freezing-point, and a layer of thin snow covers the ground. In summer the temperatures are over 70° F., and the rainfall occurs as thunder showers in spring and early summer. This means that, except for the period of thaw and summer rain, dry conditions maintain for the greater part of the year. Except in spring, there is little opportunity for soil-water to move downwards and so leach the upper soil. In fact there is more upward than downward movement, which ensures a concentration of the mineral plant-foods in the uppermost layers. Bacteria, capable of fixing atmospheric nitrogen in summer, add their annual quota of nitrates which, in the absence of leaching, progressively enrich the topsoil. In addition, dryness of the soil preserves the humus content, which imparts the characteristic black colour to the soil. These Chernozem soils are notable for having a layer of calcium carbonate and calcium sulphate at no great distance below the surface. These black soils generally occur on the loess deposits of South Russia but are not confined



Plate 16—THE STEPPES IN SPRING

Although but little natural steppe-land remains in the Ukraine there are many acres of virgin grassland in Western Siberia. These areas are noted for their flowers in the early spring when the snows have melted and the days become warmer.

to this area. In some cases the parent rock may be limestone or even old alluvium (see Fig. 34).

The drought period, coupled with the frequency of strong winds, prevents the growth of trees except for a few willows, poplars and birches, and an assemblage of marsh plants along the watercourses. Grass is the natural type of vegetation but this zone is now a most productive agricultural region like its counterparts in the prairies of North America, the Plain of Hungary and the pampas of Argentina. Remnants of the *steppe*, however, give some idea of the former natural setting.

Steppes¹ are natural grasslands found in continental interiors of the so-called temperate zone. The vegetation consists of tussocks of stipe grass, usually associated with bulbous plants like irises, anemones and tulips, which can store water in their bulbs and run through their life cycle with amazing speed. As soon as the last snows have disappeared, the steppe grasses bloom like ostrich feathers and the bulb flowers are a blaze of colour.

¹ *Steppe* is the Russian name for natural grasslands and means exactly the same as prairies or pampas in other languages. It has nothing to do with the form of the ground!

As a matter of fact, the ground receives all its moisture in spring and early summer from the melting snows and the thunder showers. This burst of life soon comes to an end, for as the temperature rises about June and the ground dries out, the landscape assumes a greyish drabness.

In the eastern districts of the U.S.S.R. there are similar Black Earth areas which have developed on former steppe-land. Near Yakutsk there is an "island" of steppe in the Taiga, the most northerly steppe in the world. East of Lake Baikal on the Angara Plateau steppes are found where the Buriats feed their herds and flocks, especially between Nerchinsk and Stretensk. At the foot of the Sayan Mountains there is another basin region of steppe-land near Minussinsk. The Amur region is grassland, but on account of the greater moisture, the grass continues to grow after the spring showers until it is almost the size of a man.

The animals are mainly rodents; they include the hare, mole, rat, marmot and jumping mouse (jerboa). The Black Earth is easy for the making of burrows and despite cultivation the little hummocks of the marmot are found everywhere. The birds include the grouse, partridge, eagle, kite and vulture, in addition to birds of passage like the starling, plover, lark and wild goose.

5. *The Chestnut Soils of the Dry Grasslands*

As the climate becomes more arid towards the Aralo-Caspian Depression, the Black Earth degenerates into a less fertile chestnut-brown soil. The grass becomes sparser and the drought-resisting plants make their appearance, e.g. different varieties of wormwood and gypsophila. The soils become browner and greyer in the neighbourhood of the eastern slopes of the Ergheni Hills and near the River Ural. This shows that some of the humus and iron hydroxides have been taken from the upper layers by the downward percolating water. This time the leaching is not the result of increased rainfall, but is due to the presence of sodium carbonate in the upper layers. This has the effect of breaking down the crumb-like structure of the Black Earth and at the same time removing the clay, iron compounds and humus from the top layers.

6. *The Saline Soils of the Semi-Desert*

With increasing aridity soluble salts like chlorides, sulphates and carbonates of magnesium, sodium and calcium may be drawn to the surface by evaporation, presenting many difficulties to irrigation schemes. This process is like the movement of ink in blotting-paper and is called *capillarity* (see p. 159). Some plants manage to grow, like the feathery grass of the steppe, irises and tulips (see Plate 5, p. 26). These grow quickly, bloom and then are gone, but there are also bushes with deep roots and few leaves, like saxaoul, desert acacia and wormwood.



Plate 17.—SOCHI, ON THE BLACK SEA COAST

The Black Sea littoral is noted for its pleasure and health resorts. The climate is Mediterranean and has affinities with the true Riviera. Sub-tropical vegetation grows luxuriantly for this coast is protected from the cold northerly winds by the Caucasus range. Notice the cypress trees and the white "sanatorium" in the background.

7 *The Desert Soils and Vegetation*

Similar processes are at work in the desert. Aridity increases and the plant-cover is almost non-existent. The soils are variable, for in many cases the wind blows the altered rock particles away and a soil is slow in forming. Some areas are stony desert, others are red-sand, e.g. Kizil-Kum. The redness of the sand-grains is due to the oxidation of iron compounds around them. Where the soluble salts are drawn to the surface by capillarity after an infrequent storm, the desert soils are spangled with white crystals. Water is conserved in hollows called *takyrs* and for a time sparse feather-grass may grow alongside salt-wort, wormwood and the other drought-resisting plants (see p. 27).

8. *The Red Soils of the Mediterranean Forest Zone*

Southwards across the Crimea, the soils vary from those typical of the steppes to the redder soils which have developed on the limestone heights of the Yaila Plateau. The increased rainfall and the milder winters allow

the humus to be leached, but the hot dry summers lead to the oxidation of the red iron-compounds. As a matter of fact, the warm moist conditions accelerate the work of bacteria in decomposing the humus.

The trees are mainly evergreens and there is a sudden change from the dreary steppe and bare rock to the luxuriant growth of beech, laurel, jasmine, box, maple, ash, with Mediterranean oak, flowering rhododendrons and azaleas. At the present time, cypress, vine and magnolia thrive, but these have been introduced by man. Such trees and bushes are only found along the South Crimea coast and the Western Caucasus for, as in other areas, the increase of altitude on the mountain slopes leads to many other changes.

9 *Mountain Soils and Vegetation*

It is difficult to generalise regarding all the mountain regions of the U.S.S.R., but certain principles can be recognised. Steep slopes prevent the formation of soil. No sooner have the rock particles weathered than they fall, or creep down the slope under the influence of gravity. Where soil can form, forests are generally found on the wetter slopes. However, there is a zonal arrangement of vegetation belts on the mountains which is in the same sequence as that encountered on a journey towards the North Pole. The factor working here is, of course, the increase of altitude causing a decrease in average temperatures. In the Western Caucasus beech woods are found up to 4000 feet and these are succeeded by the conifers, larch and pine, up to 6500 feet. The upper slopes are covered with grassland and, in the region of the glaciers, the vegetation compares with the tundra of the Arctic.

The Caucasus Region illustrates two other points. Firstly, the rainfall decreases from west to east and so do the forests. As a result the eastern mountains are barer. Here the steppe of the valleys of the Kuban and Terek to the north invades the Caucasus slopes whilst birch, alder and willow are found in the valley bottoms. Secondly, the rainfall is heavier on the northern slopes. Aspect has some influence, for the north side is the shady slope and the southern side is the sunnier and drier slope. The northern area is forested while the south is more akin to steppe, and the forests are correspondingly higher. Exactly the same is seen in Central Asia and the Baikal region. The northern slopes of the high ranges are clothed with larch and spruce while the Mongolian Steppe covers a large area on the southern side.

Some Contrasts with Western and Central Europe

Having reviewed the salient aspects of the physical background of Russia it will at once be apparent that there are very great differences between this picture and the one presented by Western and Central Europe.

There is no doubt that Europe, on the whole, provides a favourable

environment for man's activities. This is perhaps truer of the West where complexity is the keynote of structure, landscape patterns, soils and climate, just as uniformity is the dominant feature of Russia. In the West, the sea is so intermingled with the land, while in Russia the land-area occupies a large part of the "world-island" of Eurasia. These features have formed the warp and the weft of the fabric of history; Western Europe having a slightly different pattern from Eastern Europe. Russia has thousands of miles of coastline but this is largely ice-bound and of little use when compared with the tidal estuaries of warm water which penetrate miles into Western Europe.

In relief, there is a striking contrast between the complex mountains and valleys of the West and the wide plains of Russia. The primary cause of this difference is based on structure. Throughout geological history the Eastern part has shown much greater stability than the West.

It has been noted that mountains of at least three different periods are represented in Europe—the Caledonian, the Armorican (Hercynian or Alpid) and the Alpine. The trend-lines of these old mountain structures which meet in the British Isles diverge towards the East. By doing this there is space for the appearance of an extra structural unit towards the East. This is the Russian Platform which constitutes layer upon layer of rocks showing only minor disturbances, rocks ranging from Palaeozoic Age to the Tertiary Period, i.e. the equivalents of those exposed between Wales and the London area. They rest almost horizontally or are but gently warped and they underlie the great Western Plain of Russia.

Further west the remnants of the Armorican mountains now form the plateau blocks of Central Europe. In Russia, with the exception of the Urals, their equivalents lie towards the southern frontiers and so leave greater space for the development of the Russian, West Siberian and Aralo-Caspian plains.

The Urals can be looked upon as the analogue of the Pennines. The similarity extends even to its coalfields. In this connection there is a strong comparison between Eastern Europe and Western Europe in the disposition of the coalfields. As the coalfields lie on either side of the Pennines, and the Saxony and Silesian coalfields lie on the flanks of the Bohemian Massif; so the Donbas lies on the northern edge of the Ukrainian massif and the Kuzbas is situated just north of the Altai mountains.

In Southern Europe, the most important Mediterranean region is located to the south of the great Alpine mountains, but in Russia there is only a small corresponding region along the Black Sea and Crimean coasts.

As for the rivers, we have noted that they are exceptionally long in Russia but they flow into icy or inland seas. There are few deep navigable estuaries but rather deltas and sand-spits. In this latter respect they are like the Mediterranean rivers.

The usefulness of the rivers in the Soviet Union is counter-balanced by the fact that they are frozen for most of the winter-half of the year. This again shows a great contrast with the West. The average temperatures in the West vary from 40° F. to 60° F. in North-western Europe and from about 50° F. to 70° F. in Mediterranean Europe. Mildness is allied to changeability. In Russia temperatures are almost everywhere below freezing-point in winter. Rivers freeze and snow lies on the ground. Houses have double windows and the people protect their feet with felt boots and cloth bindings. The year is divided into two seasons, winter and summer. This is typical of continental climates. On the other hand, the maritime regions of the West have much longer transition periods of spring and autumn.

Western Europe is humid and under the influence of depressions for the greater part of the year. Places with over 30 inches of rain are quite common, but in Russia few stations record more than 20 inches. In fact, large tracts are arid desert. The cold continental climate of North Russia allows of the extensive development of the zone of podsol soils. In the south the steppes are a notable feature and owe their existence to the cold winters, the snow, the spring showers and the hot summers. Such conditions lead to the formation of the Black Earth soils and their grassland cover. Towards the west the interior grasslands disappear and the soils become browner as the deciduous trees take the place of the pines and firs of the Coniferous Forest Belt so well developed in the U S S R. Even in the loess deposits of Northern France there is no black earth. The moister climate is conducive to the formation of the brown earths of former forest land.

We have thus sketched briefly the natural surroundings in which man first made his home. He has altered the soil, he has cut down the forests, ploughed up the grasslands and irrigated the deserts. He has left his mark on the land surface and it now remains to examine how and where he lived in the past and to describe his work and activities at the present time.

Part II: The Peoples and Their History

CHAPTER V

THE GOVERNMENT AND PEOPLES OF THE U.S.S.R

MANY people refer to the U.S.S.R. as "Russia" and therefore everyone living within its boundaries is automatically classified as "Russian". This is not the true picture of existing conditions. The U.S.S.R. is a state made up of many different peoples, in fact, it is a *multi-national state*. This sort of state, covering one-sixth of the earth's surface and including within its compact borders close on 200 million people, is unique. Most of the other countries of Europe are, generally speaking, single-nation states¹. They consist essentially of one single nation under a centralised form of government and usually one language is common to all citizens. We shall see more fully later how Russia, under the tsars, became a nation-state about the beginning of the eighteenth century, and grew into an empire which was very different from the U.S.S.R. The Tsarist Empire was primarily a developing central nation—Russia, but also embraced colonial territories in Central and North-east Asia. The important citizens were the Russians, while non-Russians remained in ignorance and just worked to provide food, raw materials or furs for the centre. This was similar to the present relationship between the Western empires and the coloured peoples.

The Soviet² Government recognised from the beginning that differences prevail among the peoples of the U.S.S.R. It was in November 1917 that the "Declaration of Rights of the Peoples of Russia" was signed. This gave equality and the right to self-determination and to free development to all the people, including the national minorities. In 1922, at the first All-Union Congress, it was decided to unite the various Soviet republics into a single union-state, which became known as the Union of Soviet Socialist Republics.

There are now sixteen republics and they take their names from the predominant people within a certain area. Many of the peoples in these republics differ in appearance from the peoples of other republics. They speak different languages or dialects. In fact a Georgian may not be able to understand a Tadjik.

The political divisions can be seen in Fig. 37.³ The largest, both in

¹ Switzerland, Belgium and the British Isles are notable exceptions. The Scots, Welsh and Irish peoples are distinct ethnic groups.

² Soviet has the same meaning as our word "council".

³ For Fig. 37 see back endpaper.

size and population, is the Russian Republic or the R.S.F.S.R. It includes many different nationalities besides the Russians, but the latter are the most numerous. There are the five Central Asian Republics in the area formerly called Turkistan. These consist of the Kazakh, Kirghiz, Turkmen, Uzbek and Tadjik Republics. In the south-west and west of the U.S.S.R. are found the Ukrainian, Moldavian and Byelo (or White) Russian Republics. The Caucasus region has three—they are Georgia, Armenia and Azerbaijan. Finally, since 1940, the Baltic Republics (the Karelo-Finnish, Estonian, Latvian and Lithuanian) have been added.

✓ This Union of Soviet Socialist Republics shows some resemblances to other federal states like the U.S.A. The Parliament of the U.S.S.R. has two "houses," as in Britain or U.S.A. In the U.S.S.R. the Parliament is the Supreme Soviet and is divided into the *Soviet of the Union*, and the *Soviet of Nationalities*. This Supreme Soviet is the governing body elected for the Union as a whole, and carries out the usual law-making functions and executes the laws through the supreme court and the "ministries" for foreign affairs, defence, the various industries and public health. In the U.S.S.R. these are called People's Commissariats or Ministries. Each of the constituent republics has its own Supreme Soviet which can make laws and control its own education and small-scale local industries, since February 1944 each has had its own defence ministries and may even have its own diplomatic representatives abroad. However, in all these matters the individual republic commissariats work in the closest relationship with the Central Union commissariats.

To draw a parallel, the Senate of the U.S.A. has ninety-six members, two from each state regardless of size, Nevada with a population of about 100,000 sends its two members the same as New York State with over 10 million. Similarly, in the U.S.S.R., each of the sixteen *republics* sends twenty-five representatives to the Soviet of Nationalities, whether it be Turkmen S.S.R. with a population of $1\frac{1}{4}$ millions or the Russian S.F.S.R. with its 109 million inhabitants. There are, however, other differences between the U.S.A. and the U.S.S.R. In each Soviet republic there are many national groups and each of these has its representation. Within most republics there are smaller "*Autonomous*"¹ *Republics*, and most of these are in the larger Russian Republic. There are the autonomous republics of the Volga Lands—the Udmurt, Mari, Tatar, Chuvash, Bashkir, Moldavian and ten others. In the Uzbek Republic there is the Kara-Kalpak A.S.S.R., in the Georgian Republic the Abkhazian and the Adjar A.S.S.R., and in Armenia the Nakhichevansk A.S.S.R., making sixteen in all. Each of these sends eleven representatives. Further, there are nine *Autonomous Regions* or *oblasts*,² including the Jews of the Amur valley, and the South Ossetian and Nagorno-karabakh of the Caucasus. These regions each send

¹ Autonomous in this sense implies that the republic has local powers of government

² Also called Autonomous Provinces



Plate 18 —A TADJIK IN NATIONAL COSTUME.

The greater number of these Turkic people live in the Tadjik S S R on the border of Afghanistan. In some respects they resemble Europeans; they are of medium height, with clear-cut features and the strong chin is typical. The national costume for men in summer is a kind of long dressing-gown and the turban reminds one of Moslem influences. They still sing epics and folk-songs to the tune of the three-stringed *dombra*.

five representatives. Finally, the formerly backward tribes, only a few thousand strong, use their own language in their schools and courts and send one representative to the Soviet of Nationalities in Moscow. They are the ten *National Areas*¹ like the Evyenki, Komi and Chukot in the Arctic regions of the north (Fig. 37)². These peoples inherit a tradition, folk-lore,

¹ Also called National Regions.

² For Fig. 37 see back endpaper

a type of religion and culture from their past history In all there are 189 different nationalities speaking 151 different languages ; 48 only of these nationalities number more than 20,000 people each

It will be noticed that the inhabitants have been called Russians, Tatars, Uzbeks and Jews, etc., and the terms *language*, *national-group* and *people* have been used. Before we go any further it will be necessary to make the meaning of such terms as clear as possible, for to-day one often hears that a certain region should belong to the Poles or to the Finns. The question is What makes a man a Pole, a Finn, or a Russian ? Is he physically different from other people ? Does he speak a certain language ? Does he follow a certain religion ? Does he belong to another nation ?

The term *race* is used, or should be used, to mean that a group of people have certain physical characters in common. These characters may include the skin colour, type of hair, shape of head, stature, or shape and colour of eye. In this way it would be possible to see differences in the appearance of a Tadjik and an Armenian. However, even among the Tadjik group mentioned there would be many dissimilarities within the group. Some would be tall and fairer, others shorter and darker It is, therefore, being realised by scientists that the term " race " is not desirable when referring to human groups except in a very broad sense There is no such thing as a " pure " race Hence it is wrong to use the terms British race, or American race, or Russian race All the continents have acted as " the melting-pots of peoples," and different peoples have intermingled throughout history. The study of the physical aspects of peoples is called ethnology and it is now customary to call the different groups *ethnic* types and not races.

The Nazis spoke and wrote a great deal about an Aryan race This is a misuse of terms for the word Aryan is correctly used to describe a whole family of languages. This big family includes English, German, French, the Slavonic group, and the languages of India. Strangely enough, many people commonly called Jews speak a language of the Aryan group. People can be classified according to language, but it should be made clear that the language groups are not the same thing as ethnic groups.

A further grouping of peoples may be based on a similarity of *culture* This implies that people possess similar habits, similar dress, and a similar mode of life, and is often coupled with the fact that they speak the same language. People of very different ethnic type may be found at the same culture-level For example, if people are able to use the latest inventions of science, and have ideas which make for progress, we say that they are " civilized." As we shall see, many of the people in the U.S.S.R. a generation or so ago, could not read or write ; the peoples of Central Asia or Siberia were primitive backward tribes Now they can make predictors and aircraft or cure strange diseases This experience should make us wary of condemning people for being backward, or for having darker skins, or different shaped heads, eyes or noses They should not be thought inferior. It

simply means they have not been given the opportunity to become scientists, agriculturists, or engineers. In the U.S.S.R. to-day, no one is thought to be inferior because he has a darker skin, or a different shaped face, or because he speaks a strange language. There are scientists, artists, engineers and technicians found among all the ethnic groups represented in the U.S.S.R.

The behaviour of the Soviet people during the stress of war has demonstrated the meaning of the term, multi-national state. They have shown that a nation of varying ethnic types, of different languages, or different religions, having different customs and habits, can possess a unity of common purpose and action, which possibly the greatest military machine in history could not smash. They held together and died for the U.S.S.R.

We see that *the State* is another unit. It is a group of people living on a certain tract of the earth's surface, who have common ideas and are bound together by a common form of government. They are part of a common economic and political system. They have had common experiences throughout history. As a state the U.S.S.R. should be compared with the British Commonwealth rather than with Britain. In the big State called the U.S.S.R. there are the many smaller nations or nationalities. They are encouraged to retain their local habits and traditions, their music, art and language; for these enrich the culture of the larger, national unit, and each one has a share in the central Government of the U.S.S.R.

The treatment of the non-Russian speaking nationalities by the tsars was so bad that the Tsarist Empire was called the "prison-house of nations." In a way, they looked on the Central Asian and Siberian peoples as Hitler looked on the non-German peoples. This is the mentality of the "herrenvolk," who think they are born to rule the lesser breeds. The publication of newspapers and periodicals in Ukrainian or White Russian was forbidden, the non-Russian languages were not allowed in the Law Courts. However, liberation for these peoples came with the Revolution. Economic development was encouraged in these backward areas, superstition was banished and women were treated as the equals of men. The veil, the symbol of bondage, was torn away from Central Asia. Stalin, himself a Georgian, was largely responsible for putting all nationalities on an equal footing. The 1936 Constitution sums up the legal position, for Article 123 decrees:

"The equality of the rights of the citizens of the U.S.S.R. irrespective of their nationality, or race, in all spheres of economic, state, cultural, social and political life, is an inescapable law."

We shall see later how Central and Eastern Asia have been transformed from being colonies and sources of raw material to being the site of great industrial undertakings. Russian and world culture has been brought to all nationalities. Shakespeare, Darwin, Tolstoy and Marx have been

translated into scores of languages. In 1913 the total number of newspapers was 859 and of these 90 per cent. were in Russian. In 1939 the number of non-Russian language newspapers had increased over 26 fold to the enormous total of 2188, divided among 88 different languages. A state like Turkmenistan had only 58 schools in 1914 but by 1939 there were 134. Free elementary education to the age of 15 was instituted and in 1936 the children were taught in 112 languages, many of which had no alphabet before the Revolution.

It is now proposed to describe some of the main features of the most important groups of peoples in the U S S R. They are seen on Fig. 38. It should not be imagined that the boundaries are clear cut. The groups must not be mistaken for distinct and definite races. They are broad, ethnic or national groups which may possess a common language, or a distinct dialect of a larger language group. Some of them tend to follow a certain religion, or have in the past been influenced by such a creed.

As Fig. 38 shows, the chief national groups of the U S S R. can be divided into seven large units and two smaller ones.

1. *The Russians*

This national group occupies the western part of the U S S R., from the west frontiers of the U S S R. to the Urals, and extends eastwards as a tongue of settlement as far as the Pacific on either side of the Trans-Siberian Railway. This latter extension represents a relatively recent movement of people from the west of the U S S R. The chief unifying influence among the Russians is one of language. The Russians, like the Poles, speak Slav languages which are a branch of the Indo-European, or Aryan, family of languages. As will be shown more fully in the next chapter, the Russians have had a common history, which implies common tradition, customs and religion. Even though the Russians are not an ethnic group, there are certain physical aspects which are quite common. The people are stocky and they usually have broad heads. Their skin is white and their hair wavy. The Great Russians have a squarish face and their hair is often of a reddish colour. They speak the *Great Russian* dialect and had their origin in the Moscow region. The other sub-divisions are the *White (or Byelo) Russians* and the *Ukrainians (or Little Russians)*. White Russia is the swampy region of the Pripet Marshes in the Upper Dnieper basin. The chief towns are Minsk and Pinsk. On the whole the White Russians are the fairest and of medium height. White Russian is a Slav dialect and is called "White" to distinguish it from Great Russian and Little Russian. The term "White" has nothing to do with skin colour, or with the "Whites," or White guards, who were the Tsarist officers and supporters during the Civil War and Revolution, who fought the Bolshevik Red Forces, the founders of the present Red Army. The Little Russians, or Ukrainians, occupy the southern steppe-land of Russia with Kiev as their



Plate 19
UKRAINIAN GIRLS
IN NATIONAL
COSTUME

The Ukrainians, or Little Russians, are Slavs like the Great Russians of the Moscow Region but they retain their own dialects, folk-lore and costumes. The dresses of the girls are most beautifully embroidered. Their darkish hair and broad faces are quite typical.

chief centre. Their history has been different, their environment has been different, and hence their language and customs have been different. Both hair and colouring tends to be darker.

The Baltic region, surrounding the Gulf of Riga, is occupied by the Latvians or Letts, and the Lithuanians. These peoples speak Lettish and Lithuanian which are related to the Slavonic languages, and physically many of them are of the Nordic type, with blond hair and blue eyes, a long face and a moderately narrow head. They were among the last in Europe to be influenced by Christianity.

2 *The Finnish Peoples*

There are in the Volga and Ural regions of the U.S.S.R., as well as in Finland and Estonia, many groups of peoples who speak another big

group of languages called Finnish-Ugrian. They represent the descendants of a pre-Slav stratum of people and include the *Suomi* of Finland, the *Estonians*, the *Lapps* of North Scandinavia, the *Votyaks* on the banks of the Kama River, and the *Zyrians* between the Urals and the Northern Dvina. Along the Volga there are the *Chuvash*, *Mordovian* and *Mari*. On either side of the Northern Urals there are the *Nyentsi* (or *Samoyedes*), the *Khanti* (or *Ostyak*); and the *Komi* (or *Zyrians*). In addition, there are the *Voguls* (or *Mansi*), between the North-east Ural region and the River Ob valley. An expedition of the Anthropological Museum and Institute of Moscow University in 1939 found the *Mansi* looking like the typical Red Indian of America. Hungarian is related to these Finnish languages.

In physical type, the various groups are mongoloid in appearance. Their skins are yellow and they are mainly broad-headed with straight hair. Some are quite fair while others, like the *Mari*, are darker, and many of the *Votyaks* (or *Udmurt*) have reddish hair. Further east, among the *Nyentsi*, the cheek bones are quite pronounced, which shows a stronger Mongol influence. These people were often called "Samoyedes" which was the name given to them by the Russian pioneers. It means "cannibal" in Russian and was used to show their inferiority in the eyes of the Russians. This being so, the term *Samoyede* is not now used.

3 *The Turkic Peoples*

These peoples live chiefly in the Aral and Caspian region of Central Asia. They speak various subdivisions of another family of languages called *Turki*. The same term sometimes refers to an ethnic group of which the best known are the *Turks* of Turkey, the *Kazakh-Kirghiz*, and the *Tatars*. However, the physical types are mixed, but they all have yellowish skins, broad heads, with straight dark hair and the typically slant Mongolian eyes. The chief subdivisions are .

(a) *Kazakh-Kirghiz*

These are the formerly nomadic horsemen living to the north of the Caspian and Aral Seas. Many still live as they did in the past as nomadic pastoralists, keeping horses, cattle and sheep. These animals provide meat, milk and wool. Mare's milk was fermented into a common drink called *Kumiss*. The wool helps to make the tent cover, rugs and clothing. Most of these peoples adopted the Mohammedan religion and the *Kirghiz* chiefly belonged to the Sunnite branch. Many of the old Mohammedan customs, like bartering wives for cattle, have been removed. However, many of the men still shave the head and have a tufty beard. They wear an elaborately embroidered skull-cap in summer but this is replaced by a fur one with ear-protectors in the cold winter months. Their legs are

covered with large baggy leather breeches. The outer garments are robes of cotton or wool and their best attire often consists of a silk or velvet robe which may be embroidered with silver or gold. The women are distinguished by having their heads and necks swathed with loose folds of white cotton cloth in the form of a turban (Fig 39)

(b) *The Uzbeks*

They live to the north of the Amu-Darya and stretch north-west to south-east from the Aral Sea to the Pamir region. Here again, the *Uzbek* nationality is not a clearly defined ethnic group. They speak a dialect of the Turki language called Jagatai. Generally they are a little taller than the Kirghiz, the face and head are oval, the cheek bones are fairly prominent; the skin-colour yellowish, the hair black. When they grow a beard it is scanty. The customary dress consists of long robes of dark-brown cotton decorated with red stripes, and a tall sheepskin cap serves as a covering for the head. The Uzbeks have been influenced by the Mohammedan religion like the other peoples of Central Asia. They, like the Kazakh-Kirghiz, are fond of music and their folk-lore is rich in epic tales which are sung to the accompaniment of the *dombra*, a kind of three-stringed guitar (see Plate 18). In the past, polygamy was practised, the women were covered with a long black veil (*parandja*) and had to work both in the house and in the fields. They were regarded as little better than livestock. Now women have equal rights with men. They work in factories, farms and offices and are members of the Supreme Soviet of the U.S.S.R. This was formerly a nationality declining in numbers. In 1897

there were 726,072, but in 1942 the population had reached 6.3 millions and these people occupy an area as large as the British Isles



Fig 39.—HORSEWOMAN OF KIRGHIZIA.
Both men and women are skilled on horseback

(c) *Tadjiks*

In the upper valleys of the Amu-Darya and Syr-Darya, among the mountain fastnesses of the Pamirs, there is a group of people who numbered only 350,000 in 1897. These are the *Tadjiks* who in 1939 had a population of 1½ million. They chiefly live in the rural areas. The Hissar range of mountains, reaching over 12,000 feet, divides the area into a northern plain

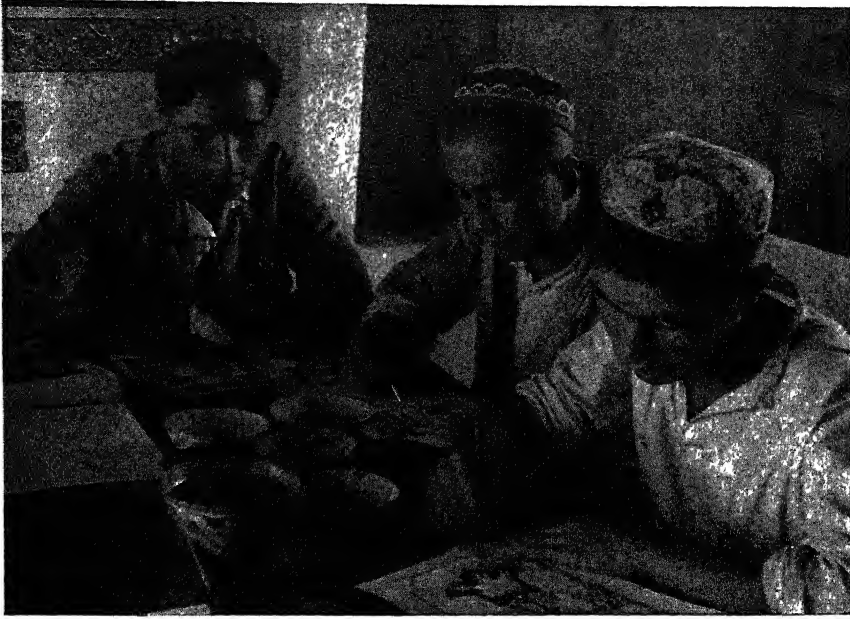


Plate 20 — POTTERY PAINTING IN AN UZBEK SCHOOL

In 1913 only 2 per cent of the people of Uzbekistan could read or write. Now there is a network of schools and universities. The national language is used and the native skill of the people is developed. These boys are being taught pottery painting and other folk arts. They still wear the traditional skull-caps like their grandfathers of old. The Uzbeks have a broad, oval-shaped head, dark hair and yellowish skin.

and southern ranges and valleys. The name Tadjik is also applied to approximately one million dwellers across the border in Afghanistan. Essentially this nationality must be considered a language group. They speak dialects related to Persian, which is itself a branch of the Indo-European or Aryan Family. As would be expected, the Tadjiks of the plains have been influenced by the Turkic elements of the population, whilst the Mountain Tadjik has retained more Persian words in his vocabulary. Although there are many exceptions, the Tadjik is of medium height, with black hair and most clear-cut features, high forehead, strong chin and quite prominent nose. If it were not for his dark complexion he would, in many cases, be considered "European" in appearance. Like the other Central Asian peoples the Tadjiks were greatly influenced by the Moslem religion and culture and, as will be seen later, the Soviet Government had considerable difficulty in eradicating the backward

practices of the Moslem faith, and the opposition from the local landlords, or beys

(d) *Turkmenians*

Inhabiting the fertile valleys of the Amu-Darya, the Tedjen and the Murgab rivers is another national group called the *Turkmenians*. There were 1.2 millions living in an area as large as Germany in 1936. They speak Turkic dialects, but those living in the foothill oases of the Kopet-Dagh and other southern border ranges, have been influenced by Persian, just as their neighbours the Tadjiks. The men may be distinguished by their high stature. They are thin but well proportioned. The skin colour is brownish and the head is high and narrow. The cheek bones are not very prominent. They too were Moslems and like the Kirghiz and Uzbeks are fond of music, songs and poetry. Their native costume consists of a cotton shirt, wide trousers, and one or two robes of either cotton or silk for special occasions, belted at the waist. They often cover their shaved heads with a cleverly embroidered skull-cap or else a tall sheepskin hat (see Fig. 40). The women have gaily coloured silk blouses and tight trousers and have a passion for pendants of silver and heavy bracelets



Fig 40.
A TURKMEANIAN

(e) *Yakuts*

In our description of the peoples, we have now dealt with the majority of those national groups which make up the varied population of the U.S.S.R. The Russians, in the broad sense, account for a little over three-quarters of the 193 million. Of these, the White Russians numbered 5 millions in 1939 and the Ukrainians some 28 millions. Central Asia has a population at present of 17 millions and it can safely be assumed that about three-quarters of these are accounted for by the national groups which have been described. It still remains to mention some of the smaller national groups living mainly in Siberia and the Caucasus. They are groups of small population whose numbers were declining before the important changes in hygiene, medicine and education were made by the Soviet Government.

Again, it will be necessary to rely chiefly on language to group these remaining peoples. In the Middle Lena valley there are over 300,000 *Yakuts*, who are an outlying group of Turkic-speaking peoples. Both their language and



Fig 41 —YAKUT

These people are most Mongoloid with flat faces, prominent cheek bones and narrow eyes

their mode of life suggest that these people were steppe-dwellers who have, but recently, occupied areas in the forest and Tundra. Their domestic animals are the horse and cow, which is in contrast to the other hunters and reindeer-breeding peoples of the north and north-east. Before the Revolution, only 2 per cent of the Yakuts had been to school, there was no Yakut alphabet, but now over 66,000 children can study textbooks in Yakutian language, in addition to learning Russian. There are now Yakut teachers and doctors, and a Yakut Theatre of Drama

(f) *Tatars*

Scattered throughout the U.S.S.R. many groups of peoples speak Turkic dialects and are called Tatars. They usually have a yellowish-white complexion, a broad head, and at



Fig 43
A BASHKIR

These Turkic-speaking, Mohammedan people are found between the Volga and the Ural Rivers. They are really Tatarised Finns

the same time have many of the characteristics of the Finns (see above p 81)



Fig 42 —A YAKUT IN FESTIVE ATTIRE

rather elongated, oval face, with a straight rather prominent nose. Along the Middle Volga near the town of Kazan, the Tatar capital, there are almost 3 million. In the Northern Crimea and North Caucasus, the *Nogai Tatars* number about 150,000. In the west of the Altai mountains east of Lake Balkash there are some 130,000 *Altai Tatars*, or *Ovats*. In the upper Ob and Irtysh valleys of Western Siberia other Tatar groups live near the towns of Tobolsk, Omsk and Tomsk. One town east of Omsk is called Tatarsk, after them

Between the Tatars of Kazan and the Urals, in the area drained by two west-flowing streams, the Ufa and the Belaya, are found the *Bashkirs*, who number about 3 millions. The chief centre is Ufa. Under Tsarism they were rapidly dying out. The Bashkirs are a mixed ethnic group. They are Moslems who speak a Turkic language, and at

4 *Evyenki or Tungus*

Stretching from the Middle Yenisei eastwards, and surrounding the Yakuts of the Middle Lena basin, are the *Evyenki*. Their chief centre is



Fig 44.—AN EYVENKI
(TUNGUS)

These also are reindeer breeders—found in the Okhotsk district. They have square faces and high cheek bones.

where the Lower Tunguska joins the Yenisei at Turukhansk. They were, in the past, mainly hunters and reindeer breeders and now number about 16,000 in an area almost as large as Germany. It was to small settlements in this area that Stalin and other Revolutionary figures, like Sverdlov and Ordzhonikidze, were sent as exiles. The people are typically “Mongolian” in appearance although the slant eye is often missing. They have black straight hair and a yellowish skin. Their faces are broad and flattened with prominent cheek bones and they have round heads which look quite flattened on top.

Scattered throughout Eastern Siberia from the borders of Manchuria to the Arctic and from the Sea of Okhotsk to the Yenisei are these tribes to which the general name Tungus has been given by the Russians. The natives never called themselves *Tungus* and the name *Evyenki* is now used. Other peoples are called *Goldi* or *Orochi* in the region near the mouths of the Amur. Some authorities think these people are of similar stock to the *Manchus*. About 5000 *Goldi* now dwell in the U.S.S.R. but over 15,000 live in Manchuria. These people were very backward tribes and greatly influenced by pagan superstition. The witch doctor, or Shaman, exploited their ignorance and with the help of a tom-tom pretended to control the spirits of good fortune. With this and his herbs he would cure all for the price of several live reindeer and a fox fur. Some have been influenced by the Tibetan branch of Buddhism and are Lamaists.

5. *The Old Asiatics*

Living in the north-east of the U.S.S.R., several thousand people are grouped into different nationalities and they bear strong resemblances to both the Eskimos and the native Indian peoples of North America. This is not surprising when one considers the width of the Behring Straits and how it may have functioned as a land-bridge in the past. In the extreme north-east, on Chukot Peninsula, there are about 12,000 *Chukots* or *Chukchis*.



Fig. 45 —A KORYAK

These people are reindeer breeders
in North-east Siberia.



Fig. 46.—THE ASIATIC
ESKIMO OR INNUIT

The Arwanat Group is found near
Indian Point on the Behring Sea coast.

The name means "those rich in reindeer" To the south, in the basin of the River Anadyr, are other nomadic reindeer men and coastal fishermen called the *Koryaks*, numbering about 8000. There are about 5000 people called *Kamchadales* on the Peninsula of Kamchatka, and some 1500 *Yukaghirs* in the Kolyma area. All these peoples possess many physical similarities. Their skin varies from yellowish to brown, the hair is black and straight. Some have quite narrow heads with a flat face and prominent cheek bones. It is thought that these people are akin to the Finnish group already described. Many of the tribes have only just received written languages and have been rescued from almost complete extinction, for their numbers were rapidly declining.

On the coast of the Behring Straits there are about 2000 *Eskimos*, or *Innuits* as they are now called. These are of shorter stature, and with narrow heads and broader faces than their neighbours. Otherwise they have the same flat face and prominent cheek bones, with straight black hair.

6. *The Mongolians*

We have already seen that many northern peoples possess Mongoloid features. Two other peoples are definitely Mongols in type and speak Mongol languages. These are the *Buryats* of the Lake Baikal area and the *Kalmyks* to the west of the Volga delta and in the Terek River region of the North Caucasus. The Buryats are closely related to the Mongols of Mongolia and the Gobi desert area lying to the south. Their language is as unlike Chinese, or Japanese, as it is unlike Russian. Before the modern developments in the area the Buryats were nomadic horse-herdsmen. They

did not hunt very much for furs, but obtained them from their neighbours. The Buryats, like all the other colonial peoples of Siberia and Central Asia under Tsarism, were illiterate and backward. They had to pay their fur taxes and other tribute. The best land was handed over to Russian colonisers. Now the position of these people is different. The population is increasing, in marked contrast to the thirty years preceding the Revolution. During this latter period the number of Buryats declined by one third. They lived in poverty and dirt and were ridden with tuberculosis and other diseases. They are Tibetan Buddhists and many monasteries were built



Fig 47.
A BURYAT
(MONGOLIAN)

in the area. It is said that there was one Buddhist monk, or Lama, for every three adult Buryats. Their religious practices forbade them to wash dishes or garments. Before 1917 only 4 per cent were educated and the language used was Russian. Now large industrial undertakings are found, agriculture is modernised and ignorance and superstition have largely been swept away by improved education. All children attend school up to the age of 15. In 1939 there were 488 schools; half of these were wholly Buryat schools with Buryat teachers. There are Buryat and Russian theatres, 147 cinemas and 17 newspapers.

To-day, over 185,000 Kalmyks live in the region to the west of Astrakhan between the Don and the Volga. They are Mongols who have been influenced by Buddhism, and represent, as we shall see, an outlier of the descendants of the great empire of Genghis Khan.

7. *Caucasian*

Here the term "Caucasian" is used in the geographical sense. Some writers give this name to the European or "white" peoples as a whole. That, however, is not the present meaning. On either side of the Caucasus mountains the most mixed groups of peoples are to be found. The Caucasus region is a veritable maze of languages and religions. Probably nowhere in the world is there such a confused picture. The reason for this is both geographical and historical. Geographical, in that it consists of isolated mountain basins which have acted as havens of refuge throughout the centuries, while the main historical events have consisted of invasion following invasion from the south, from the east and from the north. Further, the few passes across the high Caucasus range have been most important in their rôle of canalising the movements of peoples up the mountain valleys from both sides.

We have seen that it is impossible to find a pure race and, similarly, languages are not entirely pure. Any language possesses elements of other languages, and authorities are still not sure how best to divide up the

Caucasian languages Since there are many real difficulties, and the truth is still unknown, we must be content with a brief treatment of the peoples under the following headings

(a) *The Georgians*

The *Georgians* (or *Kartvelians*) speak a language which is related to Armenian with an alphabet of forty letters It is most unlike any of the other big language groups, like Aryan, or Turkic, and a separate term *Japhetic* has been coined to describe it. These mountaineers of the Western Caucasus are broad-headed and of medium stature, with dark eyes and hair, round faces and long aquiline noses Throughout history they have been noted for their physical beauty. The Christian religion, of the Greek Orthodox Church, influenced the people quite early in the fourth century It will be recalled that Stalin himself is a Georgian, and living in the Caucasus during his early years he could not help but realise the immense importance of the nationality question. There are several other dialect groups among the Georgians On the south-west frontier are the *Adjars* who, in the past, were converted to the Sunnite faith of Mohammedanism Similarly, in the north-west near the Black Sea port of Sukkhum, are found the *Abkhasians* who are shorter headed and generally speaking brunette. The Georgians in 1939 numbered over 2 millions



Fig. 48.
A GEORGIAN GIRL

(b) *The Armenians*

The Armenians retain their old alphabet and language form, and in addition they form a comparatively uniform ethnic group. The head is broad and round and it has the peculiarity of being very high and much flattened at the back so that it seems to fall almost vertically They are generally dark in hair and eyes and the skin has a tendency to be swarthy Many of them possess an extremely prominent and characteristic nose which would be termed "Jewish" by most people. The Armenians are not Jews They have been influenced by the Persian doctrine of Zoroaster, by the Armenian-Gregorian church and other faiths. It is thought by some that they are descendants of the Hittites and this would account for their large nose. They have had a tragic history in



Fig 49
An Armenian making a
musical instrument

the past, being deprived of their independence many times by Greeks, Persians, Turks, Mongols and Russians. During the First World War many of them were massacred by the Kurds, and at all times ethnic, language and religious differences have been made a pretext for oppression. Now they have their independence within the framework of the Soviet Union where they number over 2 million people.

(c) *Azerbaijans*

In the eastern plain of Transcaucasia, in the valley of the Kura and behind Baku are found the Azerbaijanians. They are a Turkic-speaking people, and like the Persians, they have adopted the Shiite doctrine of the Mohammedans. So far as physical traits are concerned they resemble the Turkmenians and possess Mongoloid features. They are medium headed, with dark-tinted hair and are of medium stature.

(d) *Minor National Groups of the Caucasus*

In the central portion of the North Caucasus slopes and along the upper valleys of the Terek and the Kuban are found many minor groups like the Chechen, Ossetian, Kabardinian and Ingush. They all speak different dialects but physically they are mixed and have been influenced in turn by the main religions.

8. *Jews*

Before the First World War there were about 6 million Jews in Western Russia, that is over one-third of the total number in the world. By the Treaty of Versailles about 3 million were left in the U.S.S.R. They form an important group of people. Under Tsarism, the Jews were debarred from owning or cultivating the soil, and they were not permitted to live either in Central Russia or in the Capital—St. Petersburg.

Pales of settlement, or ghettos, were found in most towns, and pogroms, of which we now know so much, frequently took place in Russia. Wearing long cloaks, or caftans, and beards the Jews were a familiar sight, and were forced into petty trade or acted as middlemen between the towns and the peasantry; they became money-lenders, or provided the sweated labour in the textile or cobbling trades of the towns.

In the U.S.S.R. the Jews are given absolute equality and are not discriminated against in any way, and they are now engineers, airmen, doctors, nurses and Red Army men. The Jews are encouraged to use Yiddish as their national language. They have their newspapers, the Jewish national theatre produces plays of a very high standard and is attended by many Soviet citizens and foreign visitors.

In 1928 the Soviet Government decided to set up a national home for the Jews in the Far East. It is centred around the capital of Birobijan in the elbow of the River Amur. It has now a population of about 50,000.



Plate 21 —THE GUZULS OF THE CARPATHIAN FOOTHILLS

This small ethnic group inhabits the northern slopes of the Carpathians near the headwaters of the Pruth and Sireth in Bukovina, or sub-Carpathian Ukraine. They are neighbours of the Lemkis and the Ruthenians. They are mainly animal breeders practising transhumance and are similar to the Austrians of the Tyrol in their dress, with embroidered waistcoats lined with lambs' wool. The men also wear feathers in their hats. They are noted for a very energetic dance called the *arkhan*. Notice the mountains in the background.

which seems but a small reponse, the reason being that no necessity exists for the Jews to settle in the Birobijan area in order to live a free and full life. They can do this anywhere within the U.S.S.R. However, marshes have been drained, trees cut down and collective farms established. Railway carriage and waggon works, furniture factories now specialising in plywood have been built.

It must be pointed out that the Jews who are found throughout the Soviet Union from White Russia to Birobijan do not constitute a uniform ethnic group. Physically, they show great differences. Some are dark, others fair; some have broad heads, others narrow. They have their traditional language and their religion, their habits, customs and culture to make them into a unit. Now that many are intermarrying with Russians and Ukrainians, there is a decline in the Jewish observances and they look on themselves proudly as Soviet citizens.

Like the Jews, and all other formerly oppressed peoples, the Gypsies have been given equality with the other peoples of the U S S R. The Russians call them Tzygany and the Gypsies speak their own language which is akin to the Hindu language—Prakrit. They have borrowed other words from the peoples near whom they live. Usually they are nomadic, and are familiar in most European countries wandering with their wagons and tents, their music and their own folk-lore. The men are usually horse-dealers and blacksmiths, the women makers of baskets and household utensils. Many are now just ordinary Soviet citizens and are only conspicuous in cities like Moscow by their darker faces and very dark hair. Usually they have quite long heads.

Mention has been made of the way in which the national policy of the Soviet Union abolished the inequality of peoples and as early as 1917 laid it down that national minorities and ethnic groups should have free development. In all regions the local language is used in schools and the children learn Russian as a second language. However, some languages like Tadjik, Bashkir, Ingush, Kabardinian, Komi had no script or alphabet. There was a lack both of alphabets and of educated people who spoke the languages of the Caucasus, Central Asia or Far North. In the early stages the Eastern peoples used the Arabic script, and books and newspapers were written in Kazakh, Kirghiz, Tadjik and Tatar. The languages of the Mordovians, Mari, Chuvash and Udmurt of the Volga lands were printed in Russian. Soon alphabets based on Latin script were introduced beginning in Azerbaijan in 1922. This was found to have disadvantages and so now a new movement to substitute alphabets based on Russian script is well advanced. In 1937 all peoples of the R S F S.R. except the Bashkirs had Russian scripts. Georgia and Armenia still keep their old alphabets and the Lithuanian, Latvian, Estonian and Karelo-Finnish Republics have retained their former Latin scripts.

✓ Thus we see all peoples are encouraged to retain all that is best and typical of their past cultures and to contribute their share to the advancement of the Soviet State. We have seen that as a multi-national state, the U S S.R. should be compared with the British Commonwealth of Nations and the U S A.

Most people are beginning to realise that it is along this line of development that international progress is to be made. There is no doubt that the nation-states have contributed much towards the growth of a higher civilisation but they have been involved in many wars during the last five or six hundred years. During this period frontiers have changed, but ethnic movements have been slight. It seems that lasting peace will be obtained for the world if there is the continued growth of great federations, or Commonwealths of peoples, including many self-governing nationalities.

within their borders. In these, there should be true equality, and no discrimination of religion, colour or language. The large federal and multi-national state seems, therefore, to be the next type of organisation and will supersede the single nation-state just as the latter in turn replaced feudal society. Before feudalism there was a period of something like 4000 years during which time there were periodic movements of tribes across Eurasia and North Africa.

It will now be necessary to trace out the chief historical phases through which the land now called the U S S R has passed. Only by understanding the past can we fully appreciate the present-day pattern of the peoples in the Soviet Union and their economic activities.

CHAPTER VI

THE CHIEF HISTORICAL PHASES OF WHAT IS NOW THE U S S R

THE EARLIER PHASE OF PRE-HISTORY

(50,000 B.C — 3000 B.C.)

IN the account of the building of the structures of the rocks and the formation of the mountains and plains, it was noted that the last big episode in this geological history was the Great Ice Age. Now it is not easy to transfer from thinking in terms of geological time to thinking in years and ordinary historical time. All we can do is to gain some idea of the scale of time. It is estimated that the Ice Age lasted something of the order of a million years. The ice did not extend from Scandinavia to South Russia and then retreat. It actually advanced and retreated several times. Man appeared as it were in the "Yesterday" of geological time. Even so, our knowledge for a greater part of the 35,000 years that man of modern type has inhabited the earth's surface, is but scanty. What little evidence still remains is only indirect, until men began to write about their activities. That is the time when written history begins. This large gap in our knowledge of the past is bridged by the study of pre-history and archaeology. Men have left behind their graves, their domestic utensils, their languages, their epics

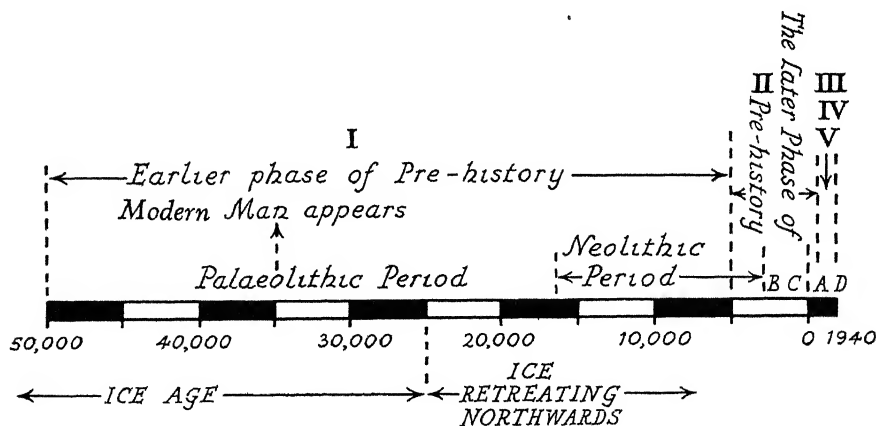


FIG. 50.—THE TIME-SCALE.

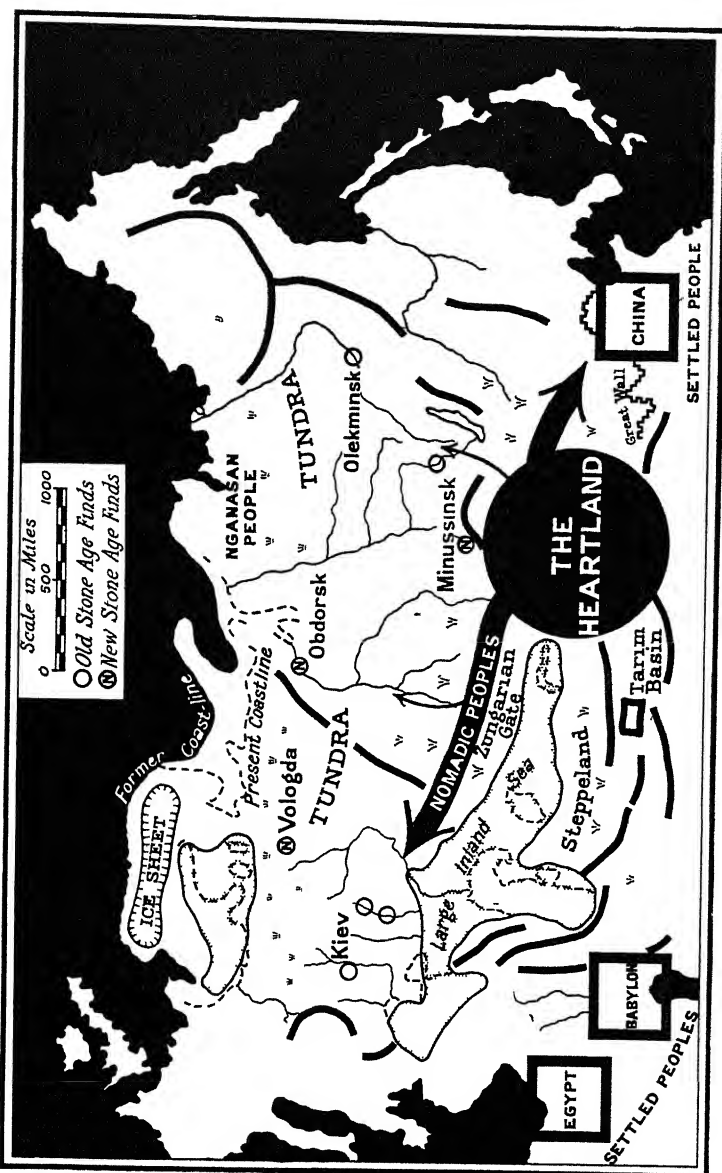


Fig. 51.—THE EARLIER PHASE OF PRE-HISTORY (50,000 B.C.—3000 B.C.).

and folk-lore, and from these we can gain some impression of their cultures and their modes of life

During this long period of pre-history men have left little of permanent importance. There are a few graves, or "Kurgan," with arrow-heads or scrapers, which do not influence life to-day to any extent. However, as we have seen, the peoples of the U.S.S.R. speak different languages, and these give a clue to the movements of peoples, and to their mode of life

It must be remembered that as the ice retreated northwards so man was able to move northwards. One of the large centres from which he appears to have moved was from Central Asia, from what Sir Halford Mackinder has aptly described as the "Heartland" of the great World-Island of Europe, Asia and Africa. This may seem strange, for at the present time Mongolia is semi-desert. But immediately following the Ice Age the climatic and vegetation regions were all much further south than they are now. When the Ice occupied North Russia, the Ukraine was most probably tundra. Mongolia was perhaps not even desert and semi-desert, but good, rich steppe-land.

1 *The Old Stone Age People*

The first men of whom traces have been found were the Palaeolithic peoples. These were most probably few in number. They lived alongside the woolly rhinoceros, mammoth and reindeer, and hunted these animals collectively, organised in large hunting groups. These are also the people who were able to carve statuettes of mammoth ivory and to draw reindeers on the walls of caves. They used stone implements and bone scrapers of a primitive kind and evidence of them has been found near Kiev, and in the Desna and Don valleys. These people could live in the caves of the Crimea and Caucasus but they lived in primitive sunken houses excavated in the soft loess of the exposed steppe. Other mammoth-hunters' camps have been found in Siberia along the Upper Yenisei, the Angara and near Olekminsk on the River Lena. This period probably began 500,000 years, or perhaps 250,000 years, ago. The later Palaeolithic people were men like us, or more probably like the present-day people of North U.S.S.R. They were not ape-men the whole time, but it was a period of *savagery* and they were food *gatherers*.

2 *The New Stone Age People*

These savage hunters of the steppes were succeeded by another community about 15,000 B.C. During this period there was a change in climate over Europe and South Russia. It was wetter, forest growth was more prolific over the region of the steppe-land. Even parts of the Ukraine were heavily forested. The climate was wetter and warmer. It was at this

same period that the Aral and Caspian Seas extended up the Volga in a great gulf and were joined to the Black Sea. There is no doubt that this large water mass diverted peoples on routes lying north of the present Aral and Caspian Seas on their way from the Heartland. This was the *Neolithic* or *New Stone Age* and it probably lasted from about 15,000 to 5000 B.C. The arrow-heads of flint belonging to Neolithic peoples were more elaborate; these people were able to make pottery from clay, and they built houses which were sometimes on piles in marshy areas. Remains of two houses similar to those of the lake-dwellers of Switzerland have been discovered at Vologda east of Leningrad. Pottery and other remains have been found at Obdorsk on the Ob, and in several places near Irkutsk, e.g. at Minussinsk. Evidence of a change in society is found. These peoples felled the trees with stone axes, kept cattle and fished. This was the beginning of settled community life and the people were *food producers*.

The two main points to remember from this latter period are that speech began, and that the Aryan language was carried into Europe by tribes moving out from Asia. Secondly, certain regions, like the more fertile river valleys of Egypt, of Babylon (Tigris-Euphrates) and the Whang-Ho in China, were able to favour the advance of civilisation. In this connection some regions have almost remained at a Neolithic stage of development. Scientists from the Soviet Academy of Sciences found quite recently that in the Taimyr peninsula, between the mouths of the Yenisei and Lena, the Nganasan people (Fig. 51) were using, in 1917, bone scrapers and primitive tools of a Neolithic type. They were organised as clans and their numbers were declining. Now they have been passing through 7000 years' cultural development in about 17 years. Similarly, the Soviet scientists have found the northern nationalities carving animals at the present time, in the same way as the people who lived thousands of years ago.

THE LATER PHASE OF PRE-HISTORY

(3000 B.C.—A.D. 800)

During the early part of this period the great ancient civilisations of the valleys of the Tigris and Euphrates, the Nile, the Indus and Whang-Ho (China) were developing. Here, man became primarily a settled agriculturist. At the same time, wave after wave of peoples was moving outwards from the Heartland. There were two causes for these movements. One was the drier climate of Central Asia which succeeded the wet climate of the Neolithic Period, this made it difficult to feed the herds. The other was the force exerted by the settled peoples of North China and Central Asia. However, the peoples moving across South Russia were nomadic horsemen and usually they possessed the advantage in clashes that developed,

for they had superior mobility over the settled agriculturists of the west. The agriculturist had a great interest in a house and a field. He had to stand his ground and fight.

We know little about the peoples of Russia during the greater part of this period. A few graves have been found containing skeletons whose bones are stained with ochre. These are thought by some to be the Aryan-speaking Nordic peoples. The next peoples who are described from the South Russian steppes are the *Scythians*. At intervals, probably after a series of dry seasons, these nomads from the region of the Black and Caspian Seas attacked the Assyrian and Babylonian Empires to the south. This took place between 650–500 B.C. Even Darius, when the Persian Empire was at its zenith, found the Scythians too mobile. He did, however, hold the area south of the Caspian and Aral Seas. It is possibly from such movements out of Iran that the Persian languages entered Central Asia, especially into Tadjikistan.

About 400 B.C. it was the *Greeks* who were the next people to impinge on Russia. They extended their maritime activities through the Bosphorus and into the Black Sea, where they founded Olbia at the mouth of the Bug (near Nikolayev) and Chersonnesus near Sevastopol, on the tip of the Crimea. This may have been prompted by the need for both wheat and slaves.

The next important milestone in classical history is the career of *Alexander the Great*. He extended his empire into Central Asia and he actually led his men from the North Balkans (Macedonia) through Asia Minor, Iraq and Persia to Samarkand and then into India. He reached Samarkand about 328 B.C.

At the time when Alexander pushed his way into Central Asia the Nordic Scythians were mingling with the Turkic-speaking Mongoloid peoples. A little to the east, nomads of similar type were being called *Huns* by the Chinese and over many centuries they have been absorbed as they moved from the Tarim Basin eastwards into China. However, about 350 B.C. the Great Wall was built to keep the nomads out of the Whang-Ho valley. This led the Huns to push west and north-west, north of the Caspian, and over the steppe-lands. Between about 200 B.C. and A.D. 200 the Chinese Empire grew in strength. The Huns were forced to drift westwards. It was about this time that the silk road from the Whang-Ho, via the Tarim Basin to Kashgar, and then leading to the Caucasus and Central Asia, began to be an important artery of trade (see Fig. 52).

It was as a result of these movements that many of the present-day peoples of the U.S.S.R. obtained their Mongoloid characters. Some of them had previously taken with them the Finnish-Ugrian language and reached Finland by way of the Volga. Their descendants are found to-day along the banks of the Middle Volga.

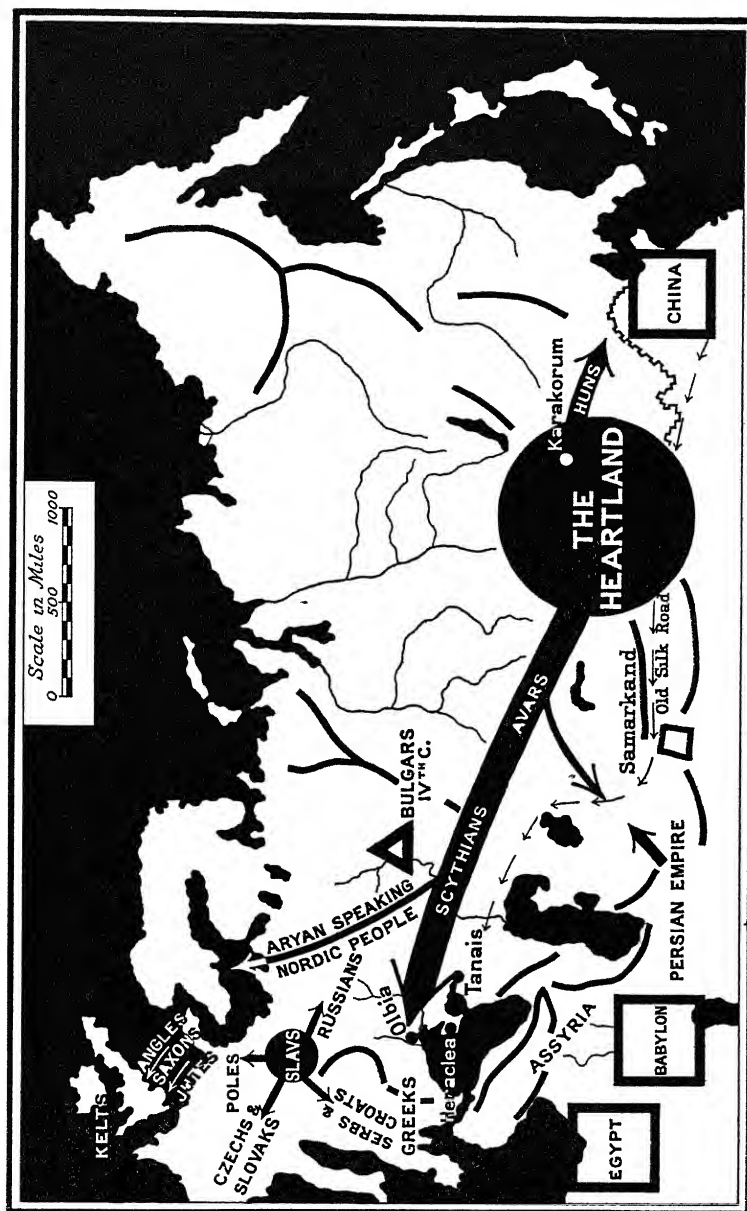


Fig 52 —THE LATER PHASE OF PRE-HISTORY (3000 B C —A D 800)

About the first century A.D. the Goths from Scandinavia moved southwards, making use of the portages leading from the Gulf of Finland into the Dnieper and Don valleys

The Hunnish migrations reached their peak of fury under Attila in A.D. 451. He marched through Germany and France and then turned against Italy. These exploits just typify the movements that took place. The newcomers mixed with local peoples with the passage of time.

It was about this period that the *Slavs* appear as a language group. They are first identified at the foothills of the Carpathians between the Middle Vistula and the Upper Dnieper. Throughout the fifth and sixth centuries they raided the eastern empire of Byzantium which was centred on Constantinople. Towards the end of the fifth century they were organised in various tribes when another wave of Hunnish invaders came from the east—this time they were called the *Avars*. This invasion was instrumental in causing an outward movement of Slav-speaking peoples. The Poles went north, the Czechs and Slovaks west, the Serbs and Croats south into the Balkans and the Russians eastwards to the Dnieper.

Very little is known about the peoples who may have lived in the forest clearings during these early centuries of the Christian era. It is almost certain that there were small tribal groups. There were some Slav-speaking peoples in the west of the U.S.S.R., and at this time the *Bulgars* were living on the banks of the Volga. They were influenced first by Turkic and later by Slavonic dialects. In the Volga region the Bulgars were horse-riding nomads of a Mongoloid type. During the eighth and ninth centuries they set up an important centre near the mouth of the River Kama. The present-day Volga peoples like the Mari, Chuvash and Mordovian are "islands" of Finnish peoples dating from this period. It is also interesting to recall that the Magyars who spoke a Finnish-Ugrian language were living along the Volga about A.D. 550. They later moved westward and, with the *Avars*, caused Charlemagne considerable trouble during the years 791-795. The *Avars* were Mongoloid Asiatics who spoke Turkic dialects.

Thus we see that even as early as A.D. 800 certain historical events had taken place which have left their mark upon the present-day nationalities of U.S.S.R. and upon bordering nationalities. So far, the story has been built up by studying the languages of people and the clues of archaeology.

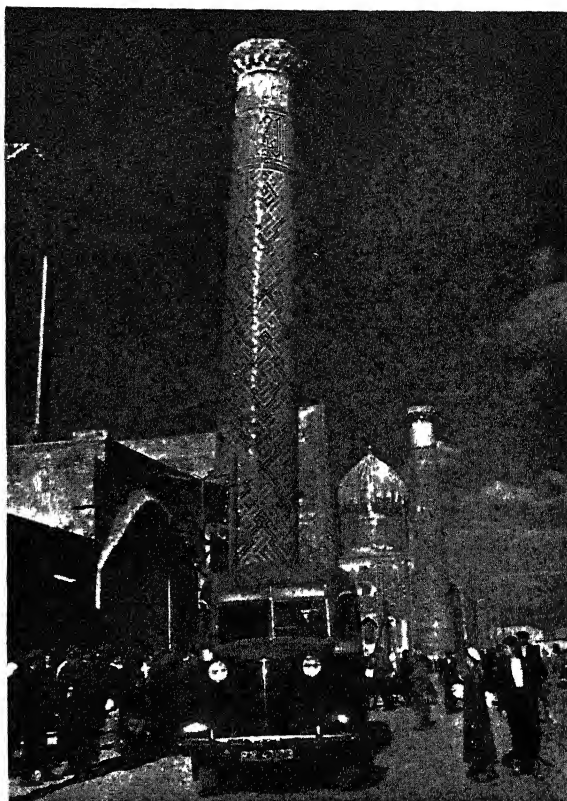
GROWTH OF THE REGIONAL CENTRES OF NOVGOROD AND KIEV (800-1240)

During the course of this period there are four features to recognise. These are made up of the action and interaction of four main waves of

Plate 22

SAMARKAND, ANCIENT
AND MODERN

Samarkand the Golden was on one of the ancient trade routes from the Orient. It has had a most interesting history, having been sacked and burned by Alexander the Great in 329 B.C. and overrun in later centuries by Arabs and Mongols. In 1369 Tamerlane made it his capital of the Great Mongol Empire. The photograph shows some of the old mosques with their fine mosaics and tile-work. Later Samarkand decayed but has been rebuilt since 1920, with its population increasing from 82,000 to 134,000 in 1939. Even to-day, it is a city of contrasts, motor-cars and European dress alongside mosques and flat-roofed houses of sun-dried bricks.



people in the area which we now know as the west of the U.S.S.R. (1) There were the *Vikings* from Scandinavia, who travelled southwards from the Gulf of Finland by the watercourses and portages. (2) They came in contact with the *Eastern Slavs* moving towards the Upper Volga in the Mixed Forest Region (Fig. 52). (3) Later, along the Baltic shores the *Teutonic Knights* moved and settled in the areas of present Lithuania, Latvia and Estonia. (4) At the same time waves of *Hunnish peoples* moved westwards from the centre of the Heartland.

There were the beginnings of some forms of unity of the peoples living in the Mixed Forest Belt. The two chief centres were developing round the early regional capitals of Novgorod and Kiev. At one time the northern peoples were able to expand southwards into the steppe-land, and at another time they had to retreat into the forests in the face of the Hunnish opposition. In the end both Kiev and Novgorod were abandoned and so the capital

left this old river-route. Moscow was then chosen for the greater value of its site, lying, as it does, at the hub of the river system of the western plain of the U S S R

The Slav Peoples

As we saw in the last period, so too during the eighth, ninth and tenth centuries there were several waves of Slav-speaking peoples moving from the Carpathians to the lands within the Mixed Forest Belt. They occupied the region in the headwaters of the Dvina, Niemen and Dnieper and later extended to the Lake Ladoga region and into the Upper Volga and its parallel tributary the Oka. These Slav peoples were organised as nomadic tribes and engaged in hunting and fishing. They also practised primitive agriculture and the method used was a kind of "shifting agriculture" comparable to that of the natives of Africa to-day. The forest was cut and burned and a few crops were snatched, and when the soil became exhausted and less productive, the clearings were allowed to revert to woodland. The same process would then be repeated elsewhere. The settlements of these people were mainly in the better-drained, hummocky country, on the sides of drumlins or on morainic ridges. Other favoured sites were portages where repair work took place, along lake shores and water-courses where fishing was a possibility (see also p 293). The chief products which resulted from this early tribal organisation were furs, game from the hunt, honey and wax collected from wild bees, together with tar and wooden articles obtained from the forest.

The Vikings

It was into this general setting that the Vikings make their appearance in the ninth century. At the same time their fellow Vikings were establishing settlements in England, East Ireland, South Scotland, Flanders and Normandy. The chief waterway they followed led from the Gulf of Finland up the River Neva to Lake Ladoga and from there up the Volkhov to the early settlement of Novgorod across Lake Ilmen and up the Lovat. In the neighbourhood of Veliki Luki and Vitebsk there were short portages from the Lovat to the Upper Dvina and from the Dvina into the Dnieper near Smolensk. This route-way brought Scandinavia in touch with the Greek centre of Constantinople, and Russia was the link. The Greeks called these Vikings the Varangians, and this name is still used very often. It was one of these Viking adventurers who became the ruler of Novgorod about A.D. 850. He is the famous Rurik.

These Varangians came as traders, pirates and raiders to the Caspian and Black Seas. The term "Rus" was a term applied to them and it is from this name that the modern word "Russia" is derived. Not only did they settle at Novgorod but also at Kiev, and it was from there that they

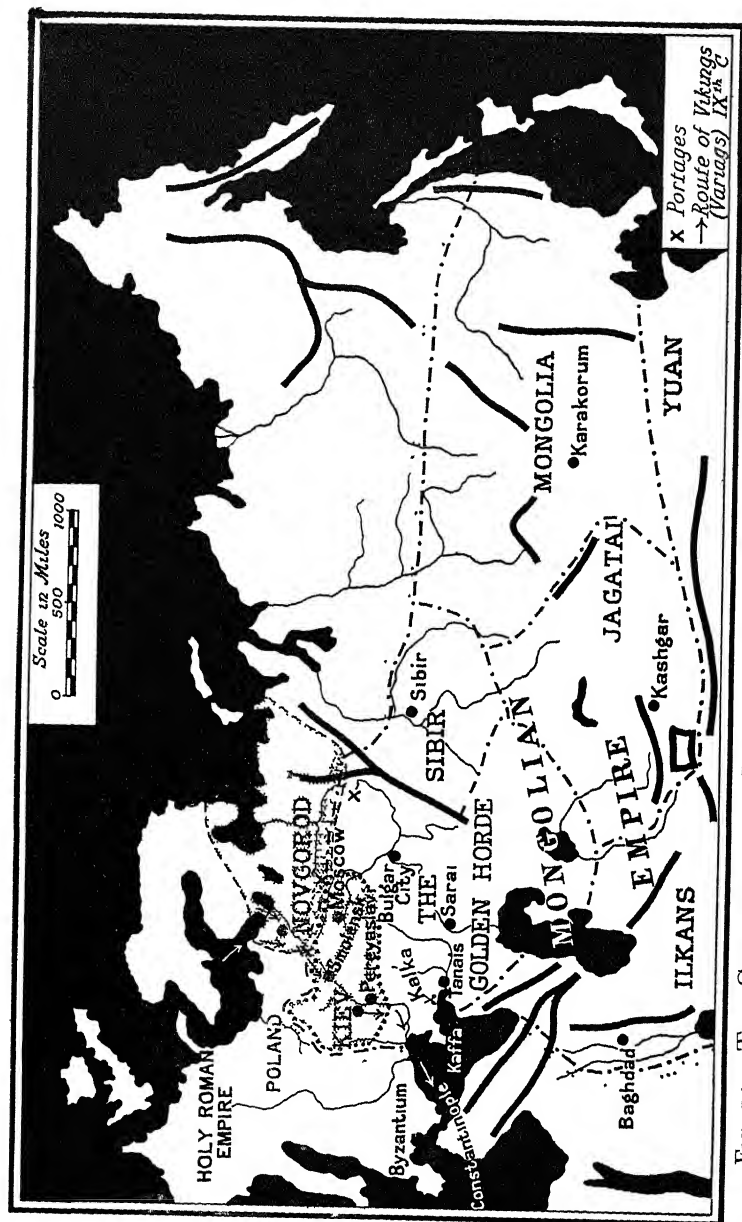


Fig. 54 — THE GROWTH OF THE REGIONAL CENTRES OF NOVGOROD AND KIEV (800–1240)
This map also shows the extent and later subdivision of the Mongol Empire



Plate 23 —ST SOPHIA'S CATHEDRAL, NOVGOROD (BUILT 1045-1050)

A treasure-house of Ancient Russian art, St. Sophia's Cathedral was badly damaged by the Nazi invasion, especially its central cupola and frescoes, gilded domes were stripped and ikons taken. The damage is being repaired where possible and the beauties of this historic centre will return.

took a fleet of small craft against Constantinople. This happened four or five times between A.D. 865 and 1043.

The "Russia" of Novgorod

Novgorod grew in importance and extended its sphere of influence towards the northern Dvina and the White Sea. Furs were the main attraction (fox, sable, marten and squirrel). Oleg (879-912) was a Norse King of Novgorod and in 882 extended his control over Kiev. Prince Igor followed; and it is this personality that gives the name to that remarkable opera and ballet by Borodin which sums up so much of this period. Incidentally, his wife Olga came under the influence of the Greek Church and became a Christian in 957. The trading of this period was down the Dnieper to the Black Sea and thence to the Greek cities; the articles of

commerce consisted of slaves, forest products, honey and wax and both furs and hides.

The Teutonic Knights

Moving north-eastwards from East Prussia, the Teutonic Knights made their appearance. They settled in Livonia, which almost coincided with Latvia and Estonia, and they set up forts and trading stations at Riga (1201) and at Revel (Tallinn, 1219). The Swedes, of similar physical type, extended into Finland, and so Novgorod had only a small outlet to the Gulf of Finland between Narva and the mouth of the Neva in the region which was called Ingria. These facts are significant, for Germanic or Teutonic influence has always been strong in the Baltic countries even to the opening of the Second World War in 1939. Secondly, Novgorod, and later Russia, have throughout history been forced to fight their neighbours for an outlet into the Baltic. However, Novgorod was able to stand up to the Teutons or Germans. In 1240 Alexander Nevsky beat the Swedes on the River Neva, and two years later he pushed back the Teutonic troops in the decisive battle near Lake Pskov. Alexander Nevsky is honoured as a hero by the Soviet Union, for there was a close parallel between the events of 1242 and 1944.

Further east, during this period, events were rather similar, except that the type of people and their languages were different. We have noted that the Bulgars and the Magyars were nomadic peoples along the Upper Volga. They moved westwards in the same way as the Huns and Avars in the fifth and eighth centuries. Between 900-950 they even raided as far westwards as France and Germany. However, there followed other Turkic peoples called the *Khazars*. It seems that these did not exhaust the waves of people from the Heartland, for in the ninth century another group called the *Petschenegs*, or *Patzinaks*, swept forward. This shows that the pattern of the peoples as seen to-day was being settled about this time, long before there was a real centralised Russia.

The Russia of Kiev

By the eleventh century, Kiev was taking shape as the cradle of Russia. It still remained a rival of Novgorod. Now one was dominant, now the other. Three times was Kiev conquered by the kings of Novgorod (822, 980, 1019). In the eleventh century Kiev was a prosperous and well-built town and it tended to overshadow, and act as the capital for, the smaller centres that were growing up. To the north-east there was Chernigov which acted as an outlet for the Desna, Oka and Upper Don areas. Others further north were Smolensk, a kind of "half-way house" and route centre, Suzdal and Pereyaslavl to the south of Kiev were both outposts against the nomads of the steppes. Even though the Slavs pushed forward settlements as far south as the Kuban, they did not survive after 1100, for

first came the *Petschenegs* and the *Polovtsi*, also called the *Cumans*. They appeared about 1060 and soon pushed back the Slavs into the Forest Belt and held sway from the Volga to the Danube.

Novgorod (Newtown) flourished as a great commercial city and was a member of the Hanseatic League. It held sway over the country between the Baltic and the Urals, and had a number of subordinate towns like Pskov, Nizhni-Novgorod (Lower-Newtown) and Vyatka. The grand-princes of all these petty states, or principalities, carried on many family feuds and disputes. Kiev was repeatedly pillaged and soon the Upper Volga principalities of Moscow and Suzdal became important. However, these struggles were ended in the early thirteenth century by the appearance of the Great Mongol Invasion. The first battle, fought at Kalka on the north shores of the Sea of Azov, was lost in 1224 against the joint forces of the Russian princes and nomadic Polovtsi. Thirteen years later, the main weight of the invasion was felt and the Golden Horde of Mongols, or Tatars, conquered the whole of Russia except Novgorod, and Russia was held under the Tatar yoke for two and a half centuries, from 1240 to 1480.

THE GOLDEN HORDE AND THE GROWTH OF "RUSSIA" INTO A NATION (1240-1584)

This next period of over four centuries, in the history of Russia, is of interest to the student of geography for five main reasons.

(1) There is the mark left on the composition of the people and their language by the Tatar invasion.

(2) Even though the Tatars were the occupying power in the early period, Russia began to grow into an organised national state; was able to push back the Tatars, and expand into the southern steppe-land. Moscow replaced Kiev as the capital of an expanding Russian nation.

(3) This expansion brought Russia into conflict with the neighbouring states of Lithuania and Poland and in the ensuing struggles the Cossacks became an important group.

(4) Russia began to strive for outlets to the Baltic, to the Arctic and to the Black Sea, and trade-routes developed.

(5) The social organisation of Russia, which was characterised by serfs, landlords and the village commune, began to grow in this period and lasted for many centuries.

The Effects of the Tatar Invasion

The Mongol, or Tatar, invasion of the early thirteenth century into Russia was the north-western extension of the great empire of the Mongol ruler, Genghis Khan. This empire spread out from the centre of the Heartland of Asia and the nucleus was south of Lake Baikal at Karakorum.

in Mongolia. From here, the warring tribes spread outwards, and under Genghis, extended from the Black Sea to the Amur, and from the Persian Gulf to Pekin. Just at the time the Mongols were sweeping into the Dnieper valley and towards Moscow, Genghis Khan died (1227). In that romantic travel book *The Travels of Marco Polo* we read how he went to the court of Genghis's successor Kublai. It was after the death of Kublai Khan that the great Mongolian Empire was subdivided and the north-western empire was placed under the Khan of the *Golden Horde*¹ (or Kipchak) who had his centre at Sarai on the Lower Volga. The other subdivisions covering the Caucasus, the upper Ob and Yenisei, Central Asia and Mongolia are shown in Fig. 54.

There is no doubt that these Mongolian nomads swept over the steppes, with sword in hand, but it is now being realised that the so-called "Tatar yoke" was not simply a matter of endless devastation and slaughter or even a period of general stagnation.

The Golden Horde was one further wave of Mongoloid peoples which has left its mark on the present-day population. The Tatars of the Volga, Western Siberia and the Crimea to-day speak Turkic languages and have been influenced by the Mohammedan religion. It was towards the end of the thirteenth century that the Khan of the Golden Horde became a Moslem. Previously they were pagan idolaters, or Shamanists. The Tatars retained their nomadic mode of life and allowed the little Russian princes some powers to rule themselves within the Mongol Empire.

Settled agriculture continued in the Forest Belt. However, the princes had to pay tribute to the Golden Horde and this is where the yoke fitted. The princes had to journey to the court of the Khan and take with them their tributes, or bribes, of money and furs. Even Great Novgorod, at the time when Alexander Nevsky had won battles over the Swedes and Teutons, thought it advisable to pay tribute. At first the taxes were gathered by Tatar officials, but later the task was undertaken quite gladly by the princes, and especially by the grand-princes of Moscow.

The Slavs were for a time obliged to retreat into their forest home once again, especially into the region lying between the Oka and Don. This is the "Mesopotamian" area in which Moscow grew to the rank of "capital of all Russia," and replaced Kiev the "mother city of Russia." This change-over was therefore influenced in no small way by the coming of the Tatars.

The Growth of Muscovy

It was in 988 that Christianity in the form of the Greek Orthodox Church came to Russia, and after the fall of Kiev the head of the Church (the Metropolitan) first came to Vladimir, just east of Moscow, in 1300.

¹ Horde does not mean a crowd or rabble of unorganised men but denotes a subdivision of the Mongolian Empire and comes from the Tatar word meaning "tent."

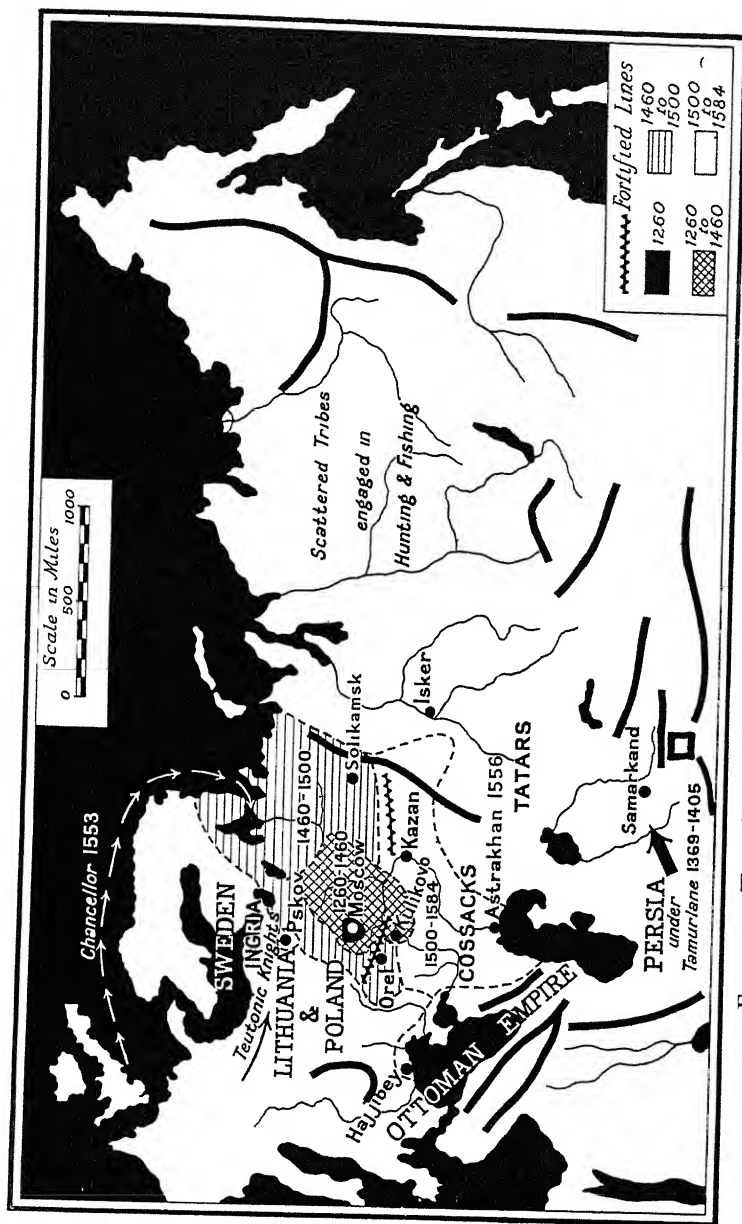


Fig. 55 —THE GROWTH OF RUSSIA INTO A NATION (1240-1584)

There was a short period when Tver (now Kalinin) was the residence of the grand-prince, but in 1318 the grand-prince was Yuri Danilovich of Moscow, so the head of the Church moved to Moscow, making it the centre of the Church in 1345 (see p 304). Thus Moscow at the hub of the river system served as a refuge when the Tatar power was highest. The princes of Moscow controlled portages and by moving along the various rivers they added neighbouring lands to their domain whenever they were in weak hands. Moscow was the rallying point of the other Russian princes, and forces were husbanded. Moscow marked time and gathered strength until the Tatars could be finally broken and pushed back.

The Moscow princes were clever in winning the good favours of the Tatar Khan. When the Khan was strong, they were obsequious and collected all the tribute. When the Khan was weak, they intrigued and became the head of a patriotic movement which aimed to throw off the Tatar yoke. In 1380 Dimitri of the Don united the Russian princes and gained a great victory over the Khan, Mamai, at the battle of Kulikovo, near the source of the Don (see Fig 55). There were further periods of ebbing and flowing. Moscow was burned by the Tatars in 1382. The Tatars themselves fought each other and the Golden Horde was defeated by a rival Tatar Khan, *Timur the lame* (or *Timurlane*), who later established himself at Samarkand and ruled Persia, Mesopotamia and parts of Turkey and North India in addition to what is now Soviet Central Asia.

Dimitri of the Don had styled himself "grand-prince of all Russia" but there still remained several independent principalities, like Novgorod and Pskov, Tver and Ryazan. However, during the next century the policy of the Moscow princes was to create a unified nation, to expand, and to crush the Tatars.

The first great phase of consolidation of the forest land with its Slav and Finnish-speaking population was effected under the rule of *Ivan III* (1462-1505). He is better known as *Ivan the Great*. Yaroslavl fell in 1463, and he did not long delay in attacking Novgorod the Great, for at this time the Hanseatic League was in a state of decline and in 1478 Novgorod was reduced to the rank of a provincial town. During his reign, there were sporadic outbursts from the Golden Horde but soon the Tatars were weakened by their subdivision into three units, or Khanates, centred on Kazan, Astrakhan and the Crimea.

It was Ivan the Great who looked on himself as the protector of the Eastern Orthodox faith, after Constantinople had fallen to the Turks in 1453. He married a niece of the last Greek Emperor and introduced much of the ceremony of the Byzantine court to Moscow and was the first ruler to give himself the title of *Tsar*, which is the Russian form of "Caesar". This is a relic of the Eastern Roman Empire, and so is the architecture of many buildings in Russia, with their distinctive, "onion-shaped" domes.

The Kremlin of Moscow, which functioned as a fortress, was partly built under Ivan III, with the help of Italian engineers and architects

Basil III (1505-33) followed in the footsteps of Ivan III and gathered further territory under the expanding wing of Muscovy¹. He dealt with Pskov, the bastion against the Baltic peoples, in 1510, just as Ivan III had incorporated Novgorod. Ryazan, south-east of Moscow, followed the same fate in 1517. Then Basil discovered that if he wished to continue on his march westward he would have to overcome the growing nation-states of Lithuania and Poland. Lithuania had grown from a small group in the middle Niemen valley by bringing many of the Slav peoples of present-day White Russia and Ukraine areas under its rule. Even the Tatar Khans recognised Lithuanian supremacy over these areas. By the year 1430, Lithuania stretched as a broad belt of territory from the Baltic Sea to the Black Sea, and grain was exported to Constantinople from the port of Hajibey, near the modern Odessa (see Fig. 55). This southern route had been more or less closed for about 200 years by the Tatars. Nevertheless, the Tatars had allowed Genoese traders to establish small colonies at Soldaia and Kaffa on the Crimean coast and at Tanais at the mouth of the Don (see Fig. 54). Under the Tatars these Black Sea ports were related to the Silk Road and China, via Sarai on the Volga, and thence to Tashkent and Yarkand in the Tarim Basin. The Caspian port of Shemakha, a little north of the site of Baku, connected these trade routes with Persia, and there was considerable traffic in silk, cotton, stones, spices and metalwork.

Even under Ivan III, the difference in religion between the Russians of the Orthodox Church and Roman Catholic rulers in Poland and Lithuania was used as an excuse for aggression. After a war lasting from 1499-1503 Ivan occupied Chernigov and Starodub to the north of Kiev. Another conflict was started by Basil III who occupied Smolensk in 1514 and it was held in Russian hands until 1610.

The policy of *Ivan IV (Ivan the Terrible)* was to obtain outlets for Russia to west, north and south. He hoped to establish trade relations with the Western Powers. In this he was the forerunner of Peter the Great. The road to the Baltic via the Gulf of Finland was blocked by the Swedes, who held Finland and the coastal area called Ingria, south-west of the later city of Leningrad. Further to the south-west the land was under Poland and Lithuania. Ivan IV tried hard to break through but failed.

The northern route-way was open accidentally and rather unexpectedly, in 1553, when seamen came to Moscow from England in quest of trade with "the north-east parts of the world, toward the mighty empire of Cathay." This was Richard Chancellor in search of the north-east passage.

¹ *Muscovy* was the name given to Russia when it was under the rule of the Moscow princes and tsars.

to China. He reached the White Sea and made his way overland to Moscow. As a result, trade relations were established between Britain and Russia, the English-Muscovy company was formed, and Archangel was founded in 1584 to deal with this trade. It is interesting to compare the parallel with the situation in 1943 when the Baltic was again closed by hostile powers and the Northern Convoy Route acted as the link between Britain and the U.S.S.R.

The Forest Steppe and Taiga country lying beside the River Kama and the Middle Volga was opened to Russian expansion by the decline of the Tatar Horde, and the ancient seat of the Bulgars and Tatars at Kazan was captured in 1552. This opened the way to the Lower Volga and the Caspian port of Astrakhan fell to Ivan the Terrible in 1556. The area of the Kama valley, that is the land between Moscow and the Urals, saw the expansion of the power of Muscovy. This period is interesting because it marks the beginning of the incorporation of non-Russian (i.e. non-Slav-speaking) peoples within the nation-state system of Russia. These peoples were the descendants of the Huns and spoke Finnish dialects. They included the Zyryan, the Kazan Tatars, the Chuvash, the Mari and the Votyak (or Udmurt). While they were engaged in subsistence agriculture, the Russians expanded and pushed these local groups further into the backwoods.

Although Ivan had obtained the important trade route of the Volga it was not entirely safe. There was some opposition from the Tatars of the Crimea, who had become the vassals of the Ottoman (or Turkish) Empire. In fact the challenge became so great that in 1571 the Tatars were able once again to attack and burn Moscow. This necessitated the construction of a second defence line in the wooded steppe country, to the south-east of Moscow. It ran through the towns of Orel and Kulikovo (Fig. 55) and consisted of a wooden palisade and earth-rampart with forts at various points along it. Several of these defence lines, not unlike the "hedgehogs" of the Second World War in principle, were constructed between the sixteenth and eighteenth centuries.

Towards the north and north-east of Moscow the early Russian colonisation was attracted by furs. These, together with walrus, ivory and seal-skins, had lured the Novgorod merchants into the northern forests. However, in the fifteenth century the search for salt was a further quest. In this, the monastic houses played their part.

Two sources of salt were at Solovetskí on an island in the White Sea founded in 1436 and near a settlement on Lake Beloe, south-east of Lake Onega, which was founded in 1397. Further to the east, in the Kama valley, another centre of the salt industry grew up among the Finnish peoples at Solikamsk. This region was developed by a family called the Stroganovs. It may be noted, in passing, that this town was situated on the chief route-way to Siberia via the Urals, and the rocks from which the

salt was obtained are of the same age and type as those yielding the salt in North Cheshire, and they are now called Permian rocks after the town of Perm, about 100 miles south of Solikamsk

The region lying east of the Urals, in the Ob basin, had been under Tatar Khans since the thirteenth century. It comprised the Khanate of Sibir, and the capital was situated at Isker on the Irtysh, near the present town of Tobolsk. At various periods in the fifteenth and sixteenth centuries this Khanate had paid tribute to Moscow. When there was a clash between the Siberian Tatars and the merchant activities of the Stroganov family, a Cossack Yermak was called in to help. Yermak began in 1581 the period of expansion into Siberia which was later to be developed still further, under Peter the Great. Towns like Tyumen and Ufa were occupied for Muscovy in 1586, but the Tatars and Bashkirs often caused the Russians much trouble.

Serfdom

Before leaving this period, it is necessary to point out two aspects of Russian society which have still left their mark on Russia although in modified form. These are the development of *serfdom* and the *commune*, and the growing importance of the *Cossacks*. Serfdom was common to medieval Europe and therefore not special to Russia, but here it developed later, and lasted longer, than in Britain. This type of society replaced the early tribal system which is often called primitive communism. This was typical of the earlier periods of history and lasted for many centuries. Men lived in small communities or clans: there was no ownership of property as we know it, but the society was organised. Men hunted in the forests leaving the women to prepare the meal, to weave and to look after the house and to care for the children. Of course each man had his spear or arrow but the produce of the chase, or of primitive agriculture, was shared in common by several families. It is not easy to place a date for the end of this kind of society. The fact is, that until a few years ago the peoples living in Northern Siberia, the Chukchis and Nyentsi, were organised in this way, so too were the Turkic peoples of the Steppes and semi-desert areas of Central Asia. Serfdom developed with the growth of Russia as a nation-state, and the need for raising an army and providing the necessary food and taxes to support the many military campaigns were contributory factors.

The Tsar owned the land, but gave some to the nobles in return for military service. These hereditary nobles and gentry could not work their land and so it was necessary to obtain cheap labour which was tied to the soil. Serfdom ensured this. From the fourteenth century to the middle of the nineteenth century, when the serfs were emancipated, there were changes in the relationship of master and serf. Again, it was typical of Muscovy and did not apply to Siberia, the Ukraine or the Far North.

The serfs were not all of the same kind. Some were virtually slaves, or domestic serfs, in the large households. Others were originally free and could leave the farms yearly after the harvest, provided they owed no rent or other debts. As can be imagined, the peasants could rarely produce a clean sheet and they were bound to their land by ties which became firmer with the passage of time.

In the forest land of the Moscow region, there was a survival in a modified form of the primitive clan-organisation. This was the *village commune* or *Mir*. It was a peasant community and arrangements were made collectively for transferring land and for establishing the right of fishing and grazing. By about 1500 the scattered plots and subsistence agriculture were giving place to the three-field system associated with clustered nucleated villages. The village community consisted of several households who elected representatives to decide the working of the three big fields and to arrange periodical distribution of the strips.

As we shall see, during the next period both the commune and serfdom continued to develop. The State used the commune as a unit of taxation, and the responsibility for the collection and assessment of the dues was left in the hands of the elders or headmen. The liberty of the serf was restricted; he was not allowed to work for another landowner offering him better conditions. For example, if a serf ran away there was no time-limit set to his recovery. It can be seen that by taxing the commune it was in the interests of that peasant community to deter their fellows from running away.

The Cossacks

From 1550 to 1650 there was a great tendency for serfs to run away from the authority of the State, the Church or the landowners. Vagrant was the term applied to them, and it was from such people that the Cossack groups were originally formed. No one can think of Russia without remembering the Cossacks riding over the southern steppe-lands, with their long black cloaks and the typical round hat trimmed with astrakhan fur from the caracul sheep. The Cossacks do not form an ethnic group, it is rather their mode of life, habits and the functions they performed that gives them unity. The term Cossack comes from the same root as "Kazakhi," meaning horsemen. Indeed, the Kazakh of the Caspian region has only quite recently left the nomadic life for the plough or the factory. The Cossack was really a free-lance liberty-loving freebooter. He may have been hunter, pastoralist, pirate or buccaneer, plundering and marauding the settled peoples in the vicinity.

Many of these former "vagrants" grouped together in the lower Don as the Don Cossacks, while others were found on the Dnieper, below the site of the famous Dam, and were called the Zaporozhian ("beyond the cataracts") Cossacks; another group grew up on the Ural foothills along

the River Ural. They sometimes worked as semi-military frontier-guards for the Tsars of Moscow against the Tatars, the Turks or the Poles ; at other times they attacked the central authority of Moscow.

THE GROWTH OF THE RUSSIAN EMPIRE (1584-1917)

This period opens with Russia stretching from the White Sea to the Caspian, and from Chernigov (80 miles north-east of Kiev) to just beyond the Urals. Under *Ivan IV* (1533-1584), Russia had been emancipated from the Tatars, the region often called Muscovy had been consolidated, but as yet the gateways to the Baltic and the Black Seas were still barred. Sweden was the barrier in the north-west, and Turkey in the south.

It is not relevant for us to discuss all the many aspects of the history of Russia from the death of Ivan IV to the First Five Year Plan of 1928. We will be content to trace the growth of the Russian Empire and to examine the life of the people engaged in agriculture and industry. In this way the present-day distributions of people, crops and mines can be viewed in some perspective.

1. *Expansion to the Baltic*

Russia provides a good example of the effect of geography on political relations. Although she has the longest coastline much of it is virtually useless. Nevertheless, Russia's rulers strove for an outlet to the sea. Archangel was built in 1584 but this faces the frozen Arctic and is ice-bound over half the year.

At the opening of the seventeenth century there was rivalry over the succession to the throne. It was the "Time of Troubles" (1604-1613). Poland regained lost territory, occupied Smolensk and Chernigov, and even put forward and backed Pretenders to the throne and advanced on Moscow. Sweden, then a great Baltic power under Gustavus Adolphus, besieged Pskov on Lake Peipus and occupied the shores of the Gulf of Finland in 1617 (Treaty of Stolbova). This event excluded Russia from the Baltic for another century.

The next big character to stand out on the pages of history is *Peter the Great* (1689-1725). He was a truly titanic character, almost seven feet tall. It is said that "he took Russia by the scruff of the neck and threw her into Europe." In any case, under Peter, Russia definitely assumed an important place among the European nations. She became a power to be considered.

Peter studied shipbuilding on his European travels in Holland, and even worked as a shipwright in the docks at Deptford. He equipped his army, and in 1700 began the *Great Northern War* with Sweden which lasted until 1721. Peter's army was badly mauled at Narva in 1700. However,

nine years later he won a decisive victory at Poltava in the Ukraine, where the Ukrainians had allied themselves to the Swedes. By the Treaty of Nystad, Russia obtained Karelia, part of Finland, Ingria, Estonia, Livonia (almost Latvia). On Lake Ladoga he took a Swedish fort and renamed it Schlussemburg, this was to figure largely in the fight with the Nazis during the siege of Leningrad (1941-1943). The victory over the Swedes ensured an outlet to the Baltic, and Peter celebrated the event by declaring that he was "Father of the Fatherland, Peter the Great and Emperor of all the Russias"

In 1703, Peter laid the foundations of a new capital city—St. Petersburg. By this event Russia's desire for an outlet to the sea was clearly demonstrated. The task was formidable, for it meant building the city on the swampy islands at the mouth of the Neva delta. Piles had to be driven into the mud, and so many lives were lost that it was said the city had been built on bones. The capital was moved from Moscow to St. Petersburg where it remained until 1918.

2 *Expansion to the West*

We have seen how the Cossacks of the Ukraine, especially the Zaporozhian Cossacks of the Dnieper, lived a life of brigandage. They founded an independent military organisation called the "Setch," ruled by their Hetman. In the early sixteenth century this Ukraine region was under Lithuania, then it passed to Poland. In the late sixteenth century and early seventeenth century the Cossacks revolted, under their leader Khmelnitski, against Polish interference. He is still looked upon as a Ukrainian hero. The Tsar (Alexius) was asked to help in 1654. He did, and in 1667 the Treaty of Andrussovo fixed the boundary between Russia and Poland along the middle Dnieper. The Black Sea coast, however, still remained Turkish.

After the death of Peter the Great in 1725, there was no expansion westwards until the reign of *Catherine II*. She is also called *Catherine the Great* (1762-1796). She so admired Peter, that she erected a world famous monument to him in St. Petersburg. Peter is seen mounted on horseback on a huge granite mass which was rolled, pulled and carried all the way from Finland. During her reign, the growing nation-states of Europe were England, France, Prussia and Austria. They were all eager for expansion. Poland, at this time, was a weak, feudal state with authority in the hands of the quarrelling nobles. This was an opportunity not to be missed by Russia, Prussia and Austria. The first *Partition of Poland* took place in 1772. Russia gained the land to the east of the Dnieper and Dvina. Reforms took place in Poland, but the greedy powers were not to be satisfied, and in 1793, Russia seized the area of the Pripyet Marshes (White Russia) and the Western Ukraine by the Second Partition. The patriots of Poland, under their hero Kosciuszko, tried to resist but his men

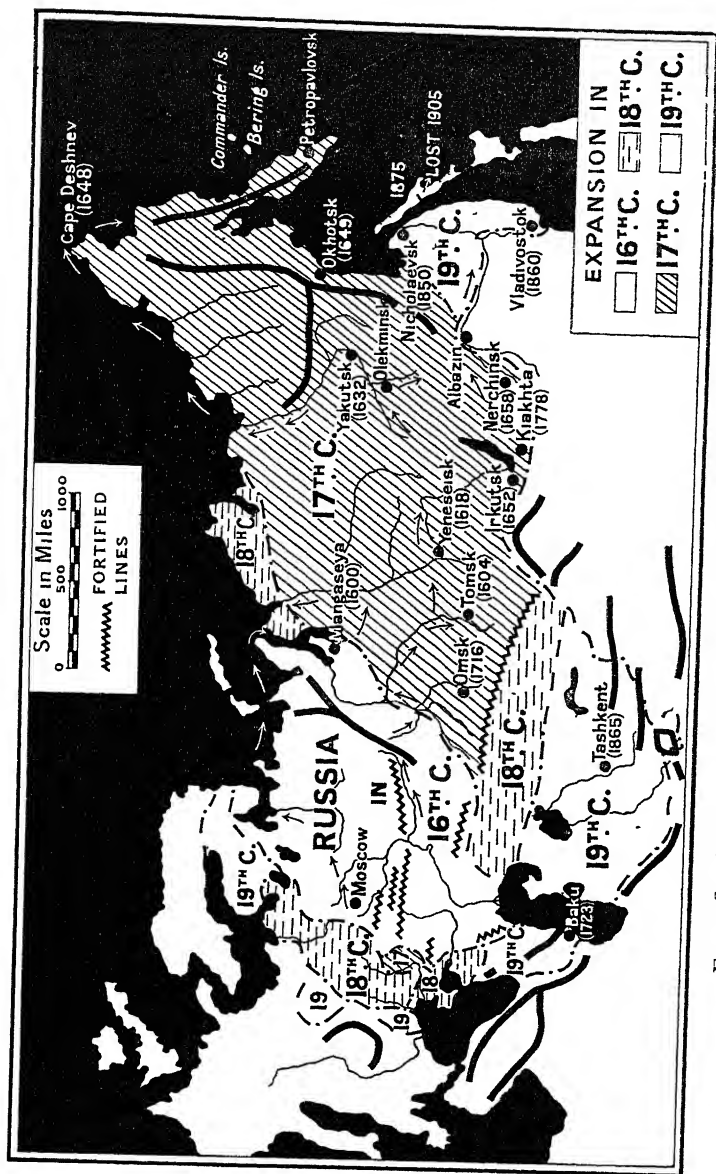


Fig 56 —THE GROWTH OF THE RUSSIAN EMPIRE (1584-1917)

were crushed by General Suvorov,¹ and the final dismemberment of Poland took place in 1795 by the Third Partition. Russia's share included the region lying east of the Niemen (Lithuania), Brest-Litovsk and the area east of the Upper Bug. By these Partitions, Poland as an independent state disappeared from the map of Europe for all practical purposes till 1921 (Fig. 57)

The next important figure to cross the stage is Napoleon. For a while Russia played for safety. She joined the Continental System, and gained the region round Bialystok in the bargain. In 1809 Russia had a victorious war with Sweden and gained the rest of Finland.

Napoleon invaded Russia in 1812; unlike Hitler, he did reach the Kremlin, but the earth was scorched. Moscow was burnt, and guerrillas harassed the retreat of the Grand Army, and the snow-covered road through Maloyaroslavets, Smolensk and Vilna became the graveyard of thousands of Napoleon's men, just as it was for the Nazi hordes 130 years after.

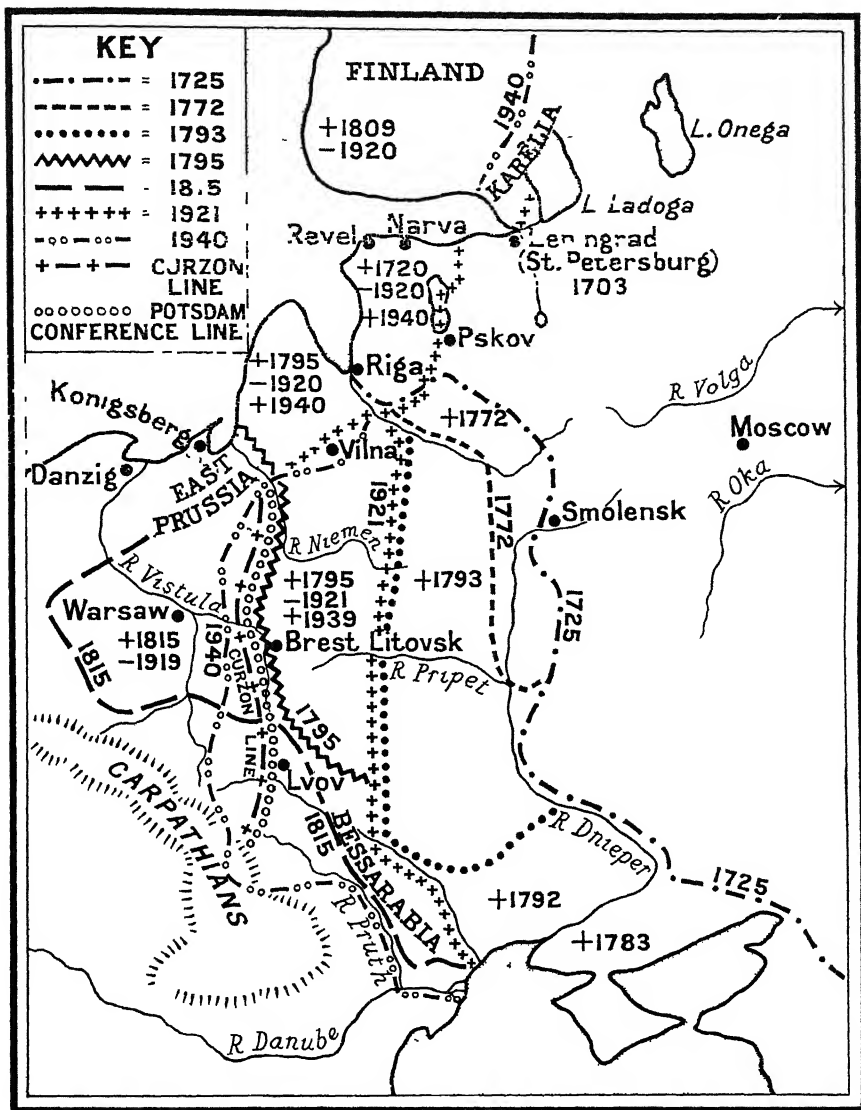
After Waterloo, the Russians and their allies entered Paris, and by the Congress of Vienna (1815), it was settled that Russia should receive the Grand Duchy of Warsaw which comprised the Middle Vistula Basin. The Tsar Alexander allowed the Poles some independence and this prompted them to revolt. However, they were forced to surrender to Russia, and Poland was afterwards incorporated into the Russian Empire, and the Polish language and institutions were suppressed. The Tsars followed a policy of "Russification" (making Russian) in Poland, as elsewhere, until their fall in 1917.

Tsarist Russia fought alongside Britain and France from 1914-1917, but in the end she collapsed under the weight of German arms. Inefficiency and the Revolution caused the defection of Russia from the Great War. In March 1918 Lenin signed the Treaty of Brest Litovsk with the Germans. It was a very hard peace for Russia for she had to cede the Ukraine. The full terms never became effective since Germany had to sign the armistice in November 1918.

However, 11th November 1918 did not see the end of the war in Russia, for the Wars of Intervention lasted from 1918-1922. Fighting developed between Poland and the new Soviet Russia about 1920. Eventually the Treaty of Riga was signed between Poland and Soviet Russia in 1921. By this, Poland pushed the Russo-Polish boundary to that of 1793, after the Third Partition, and even beyond in an embayment of Polish territory round Vilna. This was the Poland we knew from 1921-1939.

This Poland definitely included White Russians and Ukrainians within its new frontiers. These minorities were treated miserably. They had no more cultural freedom than Tsarist Russia had given to the Poles. In

¹ A medal is named after him and is now proudly worn by leaders of the Red Army and their allies.



Scale in Miles
0 100 200 300

Fig 57.—THE WESTERN MARCHLAND OF RUSSIA

This map shows the many frontiers between Russia and Poland which have moved backwards and forwards through the centuries. One zone seems to have been picked out on at least four occasions. The positive figures show the date Russia gained the territory and the negative figures the date when she lost it.

obtaining these eastern marchlands the Poles went against the advice of the Paris Peace Conference. At this, Lord Curzon had suggested the now well-known "Curzon Line," based on language and culture.

Fig. 57 shows that the plain between the Vistula and the Dnieper and Dvina has been in a state of constant flux for over 300 years. This is partly a reflection of geography. There is no marked geographical relief feature, on the other hand, there are cultural, language and religious differences. There are also definite White Russian, Ukrainian and Polish cultures and these must be the basis of any lines drawn on a map for purposes of administration in the future. The final settlement of these disputes is now under discussion.

By the treaties after the First World War, 1914-1918, the States of Estonia, Latvia and Lithuania were created, and Finland became an independent state once again. This brought peace to Finland till 1939. Finland's rulers led her into the Nazi camp and, as a result of the Armistice terms of 1944, Russia obtained the neck of land near Viipuri, north-west of Leningrad, and the Petsamo nickel mines. Estonia, Latvia and Lithuania became members of the Soviet Union in August 1940. These republics, together with Finland, provided a tempting springboard for attack against the Soviet Union. Now it appears that once and for all Russia will have a real window looking out towards Europe. The Berlin Conference of July 1945 agreed that, pending the final peace settlement, the western frontier of the U.S.S.R. should run from the Bay of Danzig on the Baltic coast to the meeting point of the frontiers of Poland, Lithuania and East Prussia. This agrees in principle to the inclusion of the city of Königsberg in the Soviet Union.

3 *Expansion to the Black Sea*

We have seen how the Black Sea was the chief cultural route-way into Russia before it was closed by the Tatar invasion in the thirteenth century. Afterwards, the Baltic Sea was the chief means of contact with Europe, especially after 1700. Although the mouth of the Volga was reached by the Russian-Slavs in 1556, the Black Sea coast was occupied by Tatars. There was, in fact, a Tatar Khan of Crimea, who throughout the sixteenth and seventeenth centuries acted as a vassal of the Turks. The steppe-lands of the Lower Volga, Don and Dnieper were the home of the marauding Cossack bands. They raided the settled Russian-Slavs of the Forest Zone. It was against this danger that the Russians built the series of defensive lines (Fig. 56). About 1650, the frontier line between nomad and agriculturist was the line of stockades and strong-points which ran from Byelgorod (north of Kharkov) to Voronezh on the Don, and then to Simbirsk (now Ulyanovsk) on the Volga.

At one period, about 1670, there was a rising of the Cossacks under their leader Stenka Razin. He raided the Volga trade-route and was the

Russian "Robin Hood." However, the revolt of this romantic figure and his bands of Cossacks was crushed by the superior weapons of the Russians

It was in 1695 that Peter the Great had ideas of opening the Black Sea gateway to the warm-water sea. He, and his carpenters and engineers, cut down forests and built a fleet of galleys on the Don at Voronezh. He actually established the naval station of Azov in 1696, near Taganrog, which he captured from the Turks. Peter was elated, went on his foreign tour and then began his Northern War with Sweden. After Poltava he hoped to continue his struggle against the Turks, but was obliged to sign a treaty by which the Ottoman Empire regained Azov.

It must be remembered that as Russia aimed to gain the Black Sea coastlands she clashed directly with the Turks. Indirectly she clashed with France and Great Britain, for they were not keen to see a rival power having an outlet into the Mediterranean Sea. There was a possible threat to the route-way to India. This struggle is well portrayed by the fact that Russia and Turkey were at war eleven times from 1676 to 1918.

Where Ivan the Terrible and Peter the Great had failed to reach the Black Sea, Catherine the Great succeeded. By this time the Ukraine had become a New Russia. The grasslands were divided into vast estates, first used as sheep runs, and later for wheat-growing on an extensive scale. Serfdom was not as strictly organised as in old Muscovy, but there was peasant labour. It was during this eighteenth-century period that foreign colonists were invited, and there was until 1941 a German colony on the Volga¹ (The Volga German A.S.S.R.)

By the Russo-Turkish War of 1774 Russia obtained the Black Sea steppes and the towns of Azov and Kerch. In 1783 the Crimea was annexed and Russian ships had access to the Mediterranean. After a further war, the steppe-land between the Dniester and the Bug was acquired together with the port of Ochakov, between the two rivers. This was in 1792. Two years later, Odessa was founded and it was soon to become the main commercial port of the New Russia of the Ukraine wheatlands.

Further coastlands were brought under Russian rule in 1812, when just before Napoleon's invasion, Bessarabia, lying between the Dniester and the Danube, was wrested from the Turkish Empire.

It is easy to see that, when Russia had gained the north Black Sea coast, she had not obtained free access to the Mediterranean trade-routes. The narrow straits of the Dardanelles governed the position, and it was not only a matter of concern for Turkey. During the last century, many

¹ These people were actually descended from the German colonists of the eighteenth century and when there was the danger from the German invasion in 1941 these people were evacuated eastwards. The Volga German A.S.S.R. which dated from 1923 thus ceased to exist in 1941.

conventions and treaties were made. It must also be remembered that from 1854 to 1856 Russia fought the *Crimean War* and was faced by Britain, France, Turkey and Austria as allies, and the first big siege of Sevastopol took place.

Finally, it is interesting to notice that during the Second World War the Dardanelles was closed, even though Turkey was not hostile to the Soviet Union. It was the first time for two and a half centuries that Turkey and Russia were not in opposite camps. Nevertheless, while Hitler held the Aegean islands and the Balkans, the contact between Britain and the U.S.S.R. had to be effected through the Persian Gulf, or by the Northern Convoy route to Murmansk. This again emphasised that both the Black Sea and the Baltic Sea "windows" of Russia can only function when friendly powers hold the approaches to these inland seas.

4. *Expansion into Transcaucasia*

The narrow isthmus (350 miles) between the Black and Caspian seas has been throughout history a cross-roads between East and West. The Caucasus too, like all mountain fortresses, has been in the past the home of oppressed peoples and war-like tribes, now retiring before a stronger foe, now raiding the peoples of the plains. Turk met Persian, and Persian met Cossack. Christian met Moslem.

The capture of Astrakhan in 1556 reopened the south to Russia after over 300 years. The Cossacks pushed into the Kuban and fortified lines were built. For many years the frontier was along the Terek River and the Kuban, that is, along the Caucasus foothills.

It was under Peter the Great that further attack was made to the south. He aimed to divert the silk trade from Persia to Russia, instead of into Turkey. In 1723 Baku was stormed, and this, with Derbent, another small Caspian port to the north, together with adjacent coastlands, were ceded to Russia. However, this gain was not very permanent; in 1735 the frontier was pushed back to the River Terek. The important centre of Tiflis (now Tbilisi), with Eastern Georgia, Armenia and Azerbaijan, remained under Persia, whilst Western Georgia and the Black Sea coast were retained by Turkey.

We have seen how Catherine the Great fought the Turks in two wars, 1768-1774 and 1787-1792, to obtain the northern Black Sea lands. At the same time, she pushed through the Kuban region and the Nogaisk steppe-lands, just as the Nazis did in 1942. However, it was after Catherine's death that the Russians were able to cross the Caucasus, by the important Dariel pass, to gain Tiflis and Eastern Georgia in 1801. Twelve years later (1813), Persia was forced to cede to Russia the whole of Eastern Transcaucasia and in 1828 the frontier was pushed to the Araxes River, where it remains to-day and includes the republics of Armenia and Azerbaijan.

After the capture of Tiflis the Russians attacked along the Transcaucasus depression to the west and the Turks lost all their territory north of Batum by 1829 (Treaty of Adrianople). It was one thing to have the Caucasus territory ceded by a power and another thing to break down the resistance of the mountain guerrillas. This task took the Russians until 1864. Resistance was supported by the British during the Crimean War, and as late as 1878 there was a rising of these mountaineers, and then Batum became Russian again.

It was noted (see pp 88-90) that the Caucasus region, even to-day, consists of many contrasted ethnic groups, speaking many different languages and dialects. Under Tsarism the oil wells were first exploited and railways were also built. There was, however, much suppression of local customs, native languages and culture. Feuds were kept alive.

During the last war, 1914-1922, Turkey once again occupied Batum and the oil region was contested by Britain, Turkey and Russia. Finally, the Tsarist army under Denikin was beaten and the Red Army captured Baku in 1920 and Turkey fixed the present frontiers with the Soviet Union in 1921.

5. *Expansion in Central Asia*

We have seen how Peter the Great was intent on pushing into Central Asia. He even sent men to explore the region of the Aral Sea, the Amu-Darya and the possibility of a road to India. This region was the domain of the Kirghiz-Kazakhs, nomadic horsemen who were organised into three hordes, the Great, the Middle and the Little Hordes. In 1730 all but the Great Horde had submitted to Russia. Again, the chiefs might submit but it was another matter entirely to subdue all the Kazakhs. It was not until 1819 that all the tribes which had hitherto been independent accepted the rule of Russia.

For many years there was friction between the Cossack settlements and the marauding Kirghiz. An attempt was made to lessen this by building forts. A line was built in 1834 from Alexandrovsk (now Turtkul) and in 1842 the lands of the Amu-Darya came under Russia.

It was in 1863 that a definite offensive was launched against the Tatar Khans of Central Asia, and Chimkent became Russian, to be followed by Tashkent in 1865. This activity made Great Britain apprehensive, for India was not far away. During the next ten years the Emir of Bokhara yielded to Russian pressure, and all the old centres like Samarkand (1868), Khiva (1873) and Kokand (1875) in the important Ferghana valley became part of the Russian Empire. In 1884, and again in 1895, British and Russian representatives fixed the frontier between Russia and Afghanistan.

The Russians encouraged settlement and in 1867 over 15,000 Cossacks came to live in the foothill region south of Lake Balkash. They called

their town Vernyi ("Faithful") It grew into a famous apple-growing region and is now the capital of Kazakhstan and has the name Alma Ata.

The important point to notice is that settlement did take place There was a long struggle by both Tatar and Slav to wring a livelihood from the desert and mountain foothills Central Asia really became a colony of the Moscow region Cotton was grown by using primitive irrigation channels which tapped the mountain streams, but it was sent all the way to Moscow and St. Petersburg to be spun and woven The people remained illiterate and the local government was in the hands of the Khans of Kokand and Khiva, and the Emir of Bokhara, until the Revolution The habits and customs of Mohammedanism were general This meant that women were like cattle. They wore the horse-hair veil—disease was rampant Even in 1890, although serfdom had ended, slaves could be bartered for a gun or a sword in the markets of Bokhara. This is still the region of strange and weird music, of gay costume, of mosques and the Moslems ; but now women represent their fellows on committees and in the government.

6 *Expansion into Siberia*

It has already been noted that Yermak crossed the Urals into Siberia in 1581 using the small stream Chusovaya, which joins the Kama near Perm, and the Tagil and Tura which flow eastwards into the Irtysh This use of river transport and short portages was the way by which the gate into Siberia was opened Apart from adventure for the Cossacks, the great attraction was furs

It is remarkable to relate that the Pacific was reached as early as 1648 by a Cossack called Deshnev. He actually sailed from the Arctic through the Behring Strait about eighty years before it was re-discovered by Behring himself. However, it must not be thought that, by this time, all Siberia had been discovered. This would not be a true statement even to-day. The real picture is one of pioneering explorers in search of walrus, extinct-mammoth ivory or furs They made their way from river to river, through tundra and taiga, and occasionally met a small encampment of native tribes living in birch-bark tents, or earth-block houses, and at a Stone Age level of culture (see p 96).

The rapid conquest of Siberia was due to several reasons

(a) The new bands of adventurers avoided the relatively more densely populated regions of the steppes and kept to the forest The natives of Siberia were more backward and presented little organised opposition

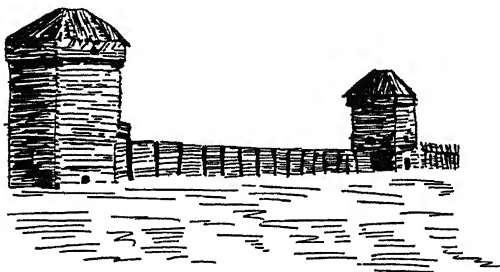
(b) The Russians had not to accustom themselves to new conditions—the Taiga is the same on both sides of the Urals

(c) Moscow helped the pioneers by manning forts and thus protecting route-ways.

(d) As furs became scarce¹ in one region, there was a hope that there would be plenty further afield.

By the river-routes the Russians settled at Tyumen,² 1586, and Mangazeya³ in 1600. In 1628 the Lena was reached, and the fort (ostrog) of Yakutsk was founded in 1632. The Buryats round Lake Baikal offered some opposition, and the Cossacks erected palisaded forts in the region. However, in 1650, Kharbarov set out into the Amur valley, into Dauria, and captured the settlement of Albazin. This was soon fortified but the Chinese resisted him and brought Russian progress to a stop by the Treaty

Fig 58—THE FORTRESS
OF YAKUTSK AT THE
BEGINNING OF THE
TWENTIETH CENTURY



of Nerchinsk, 1689. Further expansion along the Amur had to wait till the middle nineteenth century.

Behring, in addition to sailing in 1728 through the straits that take his name, set off on an expedition in 1714 across the Pacific along with Chivikov. They hugged the north Canadian and Alaskan coasts, and sailed amongst the Aleutian islands. Behring did not return to Kamchatka. He died on Behring Island, which is one of the Commander Islands, off Kamchatka.

After this expedition, a number of merchant-adventurers crossed the Pacific and the Russian-American Company was founded. This company was granted a monopoly of the fur trade in America and the prizes this time were furs and seals.

In 1796 Baranov reached an island off America now named after him, near the present town of Sitka. He, it was, who later became Governor of Alaska. By about 1820, outposts had been established along the coast of North America, as far south as San Francisco. It was in California that

¹ Furs meant wealth to the Moscow Government and the trade was later firmly controlled. A fur tribute "Yassak" was imposed on the non-Russian peoples and private trading was limited.

² Tyumen is west of Tobolsk.

³ Mangazeya is situated on a gulf of the Ob estuary. In 1946 the Leningrad Arctic Research Institute was about to send an expedition to this old town to examine excavations and try to discover the part played by Russians in the seventeenth century in the search for a Northern Sea Route.

the Russians came in contact with Spanish territory but Russia was not destined to occupy much land in North America. She was warned off by the Monroe doctrine which forbade further colonisation by any European Power. In any case, it was a great expense to feed the people in these far distant posts. Even Alaska was considered a liability and in 1867 it was sold to the United States for 7,200,000 dollars. The value of the gold output in the next fifty years was worth over forty-six times this figure ¹

The next important expansion was carried out by Count Muravyev-Amurski. He coveted the rich and varied Amur territory. In 1849 the fortress of Petropavlovsk was built on Kamchatka and the port of Nikolayevsk at the mouth of the Amur dates from 1850. Between 1852 and 1857 a chain of Russian Cossack settlements grew up along the Amur and in 1860 the Chinese recognised as Russian all the country on the left bank of the Amur (Treaty of Aigun). The remaining strip of territory lying between the Ussuri and the sea was ceded in 1860, the same year as Vladivostok was founded. If this was not an ice-free harbour it was an excellent port on the Bay of the Golden Horn.

Even during this phase of expansion to the east, there was still the same striving by Russia for a sea outlet. Even when this was found there was the further aim to find a port that suffered least from ice in winter. Petropavlovsk was superseded by Nikolayevsk which was followed in turn by Vladivostok. The movement was southwards.

The late nineteenth-century period was marked by the interest of the western powers in China and the rise of Japan. This culminated in the clash between Japan and Russia. In 1891 the Trans-Siberian Railway (see Chap. IX) was begun. It was pushed eastwards to Lake Baikal and then Russia was allowed by China to build the Chinese Eastern Railway across Manchuria to Vladivostok. The line was extended in 1898 to Port Arthur. This contributed in part to the *Russo-Japanese War*, 1904-1905, which began with a kind of "Pearl-Harbour" attack on the Russian Pacific fleet in Port Arthur. Russia never really recovered from this blow and she had to sign the Treaty of Portsmouth (U.S.A.) by which Japan gained Port Arthur, controlled Korea, Sakhalin south of 50° N., and obtained certain fishing rights off the eastern seaboard. However, Russia retained the right to use the Chinese Eastern Railway to Vladivostok ¹

¹ According to the Potsdam declaration and subsequent Allied notes to Japan (August 1945) it seems likely that the U.S.S.R. will, after the final Peace Conference, share the base of Port Arthur jointly with China; and the commercial harbour of Dairen will be made a "free port". In addition, if Japan is to lose all territory annexed during the last fifty years, Russia will regain the whole of Sakhalin and the Kurile Islands. The Treaty of Portsmouth will be reversed. Inner Mongolia may join the Republic of Outer Mongolia and have similar friendly relations with the Soviet Union.

THE RELATIONSHIP OF RUSSIA'S FRONTIERS TO GEOGRAPHY

1 *Frontiers throughout history*

(a) During the first two phases of Russian pre-history the frontiers which the pastoral nomads recognised as they moved out from the Heartland were geographical barriers. To the north there lay forests and tundra, coupled with the deterrent of an unattractive climate. The water barrier of the Aral-Caspian depression acted as a southern frontier. These nomads tended to keep to the type of geographical environment which most closely resembled their home land. They occupied the steppe country, for there it was possible to hunt the wild animals and to fish in the rivers. Frontiers were really barrier zones; a kind of no-man's-land.

(b) Even during the third period which saw the growth of the "Russia" of Novgorod and Kiev, frontiers were still ill-defined. Certain townships and forest settlements were organised under petty rulers who now owed allegiance to Novgorod and now to Kiev. There was a geographical frontier between these settled people of the forest clearings and the warlike Tatar nomads to the south and south-east. Here, there was a change in the mode of life. Unlike the settled peoples of the forest zone, the wandering nomad had no firm "roots" in a small plot of land, he had no settled home to lose or to be burnt. The northern frontier was the harsh deserted tundra with its short growing season and its long forbidding winters. For a short time the mountain barrier of the Urals halted the progress of the Novgorod merchants in the east, but this was only temporary.

(c) It was in the fourth period, which saw the end of the Tatar domination, that the idea of nationality germinated and grew to be an important factor. People began to think in terms of a national state. They felt they were alike in being "Russians." They had something to defend in common, their mode of life, their houses and possessions. The need for defence meant the need for service to the State, i.e. to the Tsar. The Tsar needed an army and he repaid the noble by granting him land. Then, the nobles, in return for their protection of the peasant, demanded service from him. Thus grew up the feudal system and serfdom. The feudal era was to last until the coming of industry which in turn saw the growth of capital and the means of producing articles on a factory basis instead of in the home.

Russia grew as a nation-state and the need for precisely defined frontiers arose. Even so, the Russians continued to drive outwards first from Moscow and later from St Petersburg as centres. It was during the early part of this period that the first of the fortified lines was built. These as we have seen were lines of forts, defence works and stockades which ran north-east to south-west between the Volga and the Desna, a tributary of the Dnieper. These frontiers were artificial and only made use of minor geographical features to help the task of defence. It is interesting to notice that they

were similar in function to the Great Wall of China, built in the period of pre-history to keep the nomads out of China

To the west, there was the growing need for a frontier between Russia, Poland and Lithuania. These frontiers, even when imposed, were very flexible. At one period the Dnieper and Desna proved effective river boundaries, and the Pripet Marsh area was an effective obstacle and a negative region for many centuries.

(d) It was the last period of history after 1600 which saw the progressive growth of Russia as a nation, and as an empire. At the end of the eighteenth century Russia had a sea frontier, the most satisfactory of all frontiers, in the north and east, and along the northern Black Sea coast. To the south of Siberia and Central Asia the frontier relied on fortified lines, the barrier mountains near Lake Baikal, and the Argun, tributary of the Amur as far down as Albazin (see Fig 56). At the end of the nineteenth century the north, east and south frontiers were practically the same as now. It was in the west that the question of frontiers was a vital issue between the nation-states of Central Europe.

2. Frontiers To-day

(a) The Northern and Eastern Frontiers

Russia has the advantage of a coastline frontier in the north and in the east. Lying beyond the coast there are the islands of Novaya Zemlya, North Land and the New Siberian Islands, Franz Joseph Land and the Commander Islands. These lie in the Arctic Ocean and the Behring Sea.

(b) The Southern Frontier

In the broad sense, Russia's southern frontier coincides with the edge of the mountain ramparts of the high and semi-desert plateaux of Central Asia. Thus the U.S.S.R. now includes the whole of the North Asiatic plain and in addition, some of the ranges and plateaux in the north-east.

Looking more closely we see that the boundary follows, for varying distances, several rivers. The frontier with Manchuria makes use of the Ussuri River to Kharbarovsk and then for close on a thousand miles it follows the Amur and Argun. Then again, the Upper Amu-Darya acts as frontier between Afghanistan and the U.S.S.R. from the Pamirs to the plain. From here, the boundary follows the northern edge of the Iran Plateau, along the Kopet Dagh, later following the Lower Atrek River. The southern shores of the Caspian are then used, then it follows another river, the Araxes, between Armenia and the Turkish-Persian borders. After following the north Black Sea shores the frontier, since June 1940, has been once again the River Pruth. This includes Bessarabia and parts of Moldavia in the U.S.S.R. Prior to 1940 the frontier between the U.S.S.R. and Rumania has been along the Dniester.

Plate 24.

A MOLDAVIAN GIRL.

Moldavia is situated in the extreme south-west of the U.S.S.R. Before the end of the First World War it belonged to Russia but was afterwards occupied by Rumania. It was restored to the U.S.S.R. in June 1940. Moldavia includes the rich black-earth downland between the Rivers Pruth and Dniester and is famous for its vineyards and orchards of plums, apricots and peaches.



This southern frontier shows that the desert fringes act as a *natural or geographical barrier*. Such barriers are the favourite frontier lines and it is interesting to notice that the desert of the Caspian region (Kara Kum) was not incorporated in Russia until railways allowed supplies to be taken from Moscow to fortify this new frontier. The mountains, like the Sayan and part of the Tien Shan, similarly fall into the same category. At the same time it must be pointed out that mountains and desert regions rarely form perfect frontiers, for passes, or lines of oases, allow the peoples of the frontier zone to intermingle. Thus these frontiers rarely separate peoples of different language or different ethnic type.

River boundaries are frequently used between countries. A river is easily defined but is apt to create problems if it moves its channel. Further disadvantages are that a river may be used for transport by both adjoining

states and friction may be created ; again a river valley is usually a geographical unit with similar occupations and requiring uniform administration.

The U.S.S.R. has one example of a purely *artificial boundary* in the frontier with Japan on the island of Sakhalin, which follows latitude 50° N. This may appear a most sensible solution. However, it may be easy to draw the line on a map but it needs time and skill to define such a line on the ground. Again, such a frontier takes no notice of geographical units or settlements. It could even cut a town in halves.

(c) *The Western Frontier*

In the west, there is no well-marked geographical boundary and here most friction has developed between the expanding and rival nation-states of Poland and Russia. With the coming of the twentieth century, there has grown up the practice of using *ethnic frontiers*. By this an attempt is made to include all the people of one ethnic type within the same state boundary, making full allowance for language, tradition and native customs of the people. As we have seen, usually the race is so mixed that this is no easy solution.

The "Curzon line" was suggested by Lord Curzon in 1919 and was the outcome of work by the Peace Conference Commission on Polish Affairs. This included the majority of the White Russians and Ukrainians in the U.S.S.R. and the Poles in Poland. However, as we shall see below, the Poles did not accept this solution. The frontier between Germany and the U.S.S.R., when Poland was obliged to give up the fight in September 1939, followed very closely the Curzon line with the exception of the embayment of Bialystok. In two sections this 1939 frontier followed parts of the Rivers Bug and San, both tributaries of the Vistula (see Fig. 57).

In the case of ethnic frontiers there is generally a minority of people who are thus included in the "wrong" state. This can be solved by evacuating these minority peoples, or else by trying to absorb them. A further solution would be to give them some measure of self-government within the larger state organisation.

Several examples come to mind, of people being evacuated from one area to another. The Germans living in the Baltic provinces of Estonia, Latvia and Lithuania were sent to German territory in 1940 when the Baltic republics became part of the U.S.S.R. After the First Great War, Greeks were sent back to the Balkan Peninsula, after having settled in the coastlands of Asia Minor.

Absorption of a group of people within the framework of another state would perhaps be possible if there were the same standards of life on both sides of the new frontier. Such a condition rarely exists, and these minorities are so often used as a pretext to cover up baser expansionist policies. The expansion of Nazi Germany showed this to a tragic degree.

It seems advisable that modern frontiers should be drawn on an ethnic basis. This is the basis of the acknowledged successful solution of the nationality problem in the U.S.S.R. (see Chap. V). There will always be the need for boundaries round administrative units, but it seems generally agreed that, when a frontier signifies a tariff wall, a change of money values, a change in level of culture, it is a disadvantage. A world of rival nation-states has been a world of frequent wars. The ideal world may be one which has a global plan for agriculture, industry and the movements of products from the place of production to the place where they are to be used. Boundaries will then be round peoples of similar language, at a similar stage of development, with similar local habits and customs and probably a similar history and tradition. The U.S.S.R. has given the world an example of how it is possible to weld a truly unified state and at the same time allow local freedom for development.

THE LIFE OF THE PEOPLE BEFORE THE REVOLUTION

1. *Agriculture*

Before the Revolution of 1917 a fifth of the people of Russia comprised nobles, clergy, merchants and military whilst the great mass of the peasantry made up the remaining four-fifths of the population. However, in the nineteenth century it was gradually being realised that serfdom was a handicap to Russia. The method of production was inefficient, and Russia could not develop industries like western countries since all her labour force was tied to the land. Therefore in 1861, only just over eighty years ago, the serfs were emancipated. The first result was that the household serfs were free to leave and go to work in the towns. Secondly, the serfs were allowed to keep their strips or allotments in the common field together with their houses, but they had to pay rent as before. They were allowed to buy their freedom but most of them, even with the help of the State, found it almost impossible to pay merely the interest on the sum of money for their redemption. The landowners were often crafty enough to deprive the peasants of just the land they required, e.g. *pasture*, so they still had to rent some from him. The peasant thus remained a member of the village commune which continued to organise the cropping and to collect the taxes as before.

Peasant farming could not fail to be inefficient with the three-field system, the wooden plough, a hired ox, the flail and no spare money to buy manure or fertilisers. In the old area of Muscovy, the *agriculture of the forest clearings* was of a subsistence type. The peasant could not feed his family from his allotment even on meagre fare, therefore he had to buy grain which came from the south, or else rent more land. His position was made still worse because he had to sell some of his products to pay

for his rent, taxes and any debts he had incurred. There was not only hunger for food, but hunger for land. This is an obvious corollary to the fact that there was one peasant to every forty acres of land, and only one nobleman to about 13,500 acres (see Fig. 59).

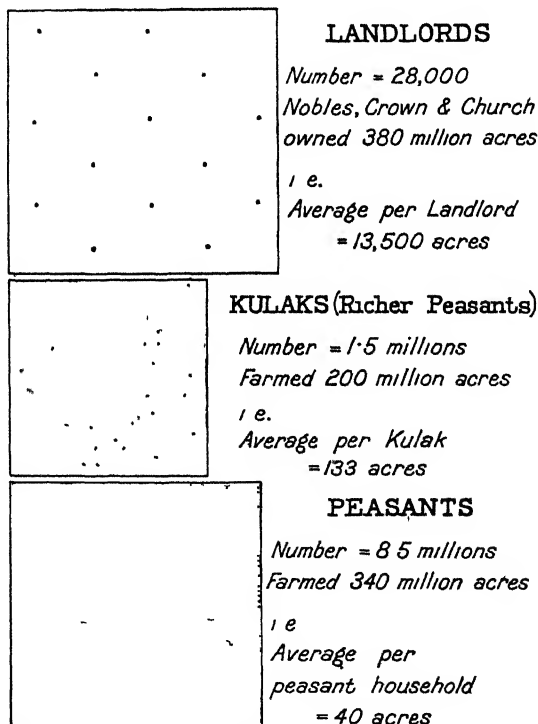
The forest soils of the Taiga were poor, but crops of rye, barley, oats, turnips and flax were grown. The peasant lived on rye bread with beet and cabbage soup. When the soil fertility was exhausted the patch of land reverted to woodland. The forest produced timber for house construction and fuel, and became an article of commerce for the landowner. It must not be forgotten that some cash-crops like flax and hemp were grown, but chiefly for export.

Some of the peasants in 1917 had become quite well-to-do despite all the difficulties. They bought up the land of the poorer peasants, lent money and became known as *kulaks*, which means "fist." They were notorious for being tight-fisted!

In contrast to the smaller holdings of North Russia, the *Ukraine* was a land of large estates. They were owned by enterprising squires and wealthy

Fig. 59.
THE DISTRIBUTION OF
LAND BEFORE THE
REVOLUTION.

An attempt has been made to show the number of nobles and landlords in proportion to the area of land owned by them and the number of peasants in relation to the area of land which they farmed. The pressure of the poorer peasant population on the land is most apparent.



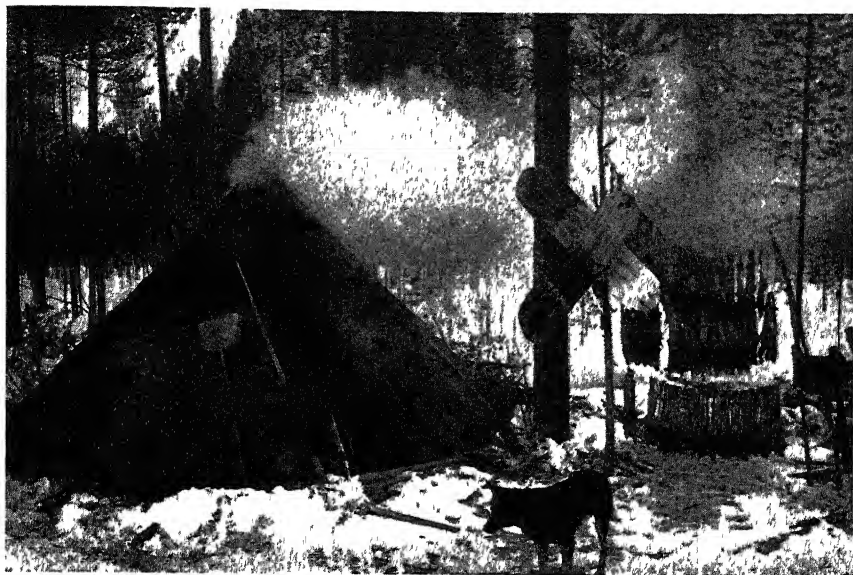


Plate 25.—A TRAPPER'S WINTER HOME.

The tent of reindeer skins over a framework of birch still serves as a shelter for the trapper as it has for many centuries. Notice the pelts hanging up to dry and the snow-shoes, with the wolfhound standing guard.

peasants. Here we find what is now called *capitalist* agriculture. A large area was devoted to wheat production, not for the use of the farmer himself, but for selling to North Russia or for export. Odessa was the great grain port and it must be remembered that at this period in history Russia produced one-fifth of the world's wheat and was the greatest exporter. On the other hand, the Moscow region had a cereal deficiency, it was a grain-consuming area which could only live for part of the year on its own rye harvest. It was the Ukraine which had the grain surplus. Agriculture was also more efficient in the south because by selling wheat the farmers were enabled to buy machinery and to improve methods of production. However, it did not follow that the peasantry were better fed. The wheat left the region. In addition, this fertile Black Earth region was quite frequently scourged with famine, due partly to drought and partly to continuous cropping without a proper rotation.

The land hunger of the peasants was partially appeased by the flow of people into Siberia. At the beginning of the twentieth century there were only about six million people in Siberia and of these 80 per cent. were Russian immigrants. During various periods, the government seemed to

discourage this movement but the pressure was too great. The farmers settled in the region between the Urals and Lake Baikal, on either side of the Trans-Siberian Railway. These people grew wheat, barley and rye, and were engaged in the subsidiary occupations of bee-keeping, hunting and fishing. The population of Siberia was increased by the addition of Cossack guards for the forts. Peasants were settled to help with communications or to tend the horses on the post roads. Civil and political prisoners were exiled to Siberia. Many of them were men capable of introducing new ideas in agriculture and they carried out much good work among the backward peoples. Dairy farming began and Siberia became quite important as an exporter of butter. To the north the Tundra remained the home of hunting tribes who were engaged in exchanging furs for knives, fire-arms or a bottle of vodka.

The agriculture of Central Asia depended largely on irrigation. This colonial appendage supplied the centre of the Empire with cotton. Wheat and fruits were grown in the oases but the semi-desert steppes were the home of wandering tribesmen who tended their flocks as they had done for centuries.

2. Industry

The industrial output of the Russia of 1917, that is just before the Revolution, was similar to the Russia of 1928, just after the Civil War and the famine. It was this Russia which preceded the Five Year Plan and was most notable for the low level of economic development when compared with countries like Britain and Germany. Nature had endowed Russia well, that is now evident ; but these resources were only just touched in 1928. The striking fact of the development of the industry was that it was concentrated in five industrial districts—the former St. Petersburg, Moscow, the Donbas, the Baku area and the Urals. These regions, although occupying about 6 per cent. of the territory and situated chiefly in the west, produced 70 per cent. of the industrial output. The appearance is therefore of an unbalanced development.

(a) Mining. Tsarist Russia possessed only one coal-producing region—the Don Basin in the Ukraine, where 87 per cent. of all the coal was mined in 1913. Coal production in Russia did not increase very rapidly until the beginning of the nineteenth century. In fact, the Russian Empire only produced 300,000 tons in 1860, but this expanded to 18½ million in 1904, and 29 million in 1913.

Table I

OUTPUT OF COAL

1860 .	300,000 tons	1904 .	18,620,000 tons
1880 .	3,280,000 „	1913 .	29,100,000 „
1900 .	15,878,000 „	1940 .	164,600,000 „

When it is remembered that coal is the most universal motive power and driving force of industry, the backwardness of Russia at this time is at once realised. Wood was used to a large extent as a fuel for houses and for industry, and it has been estimated that 150 million tons of wood were used every year for domestic purposes alone. Hydro-electricity in 1913 was undeveloped (total, 194.5 million kw. hours), but crude petroleum was used to drive ships and some railway engines.

Lenin tried on one occasion to point out the backwardness of Russia and he used the consumption of *iron* as an index. He said :

“ In the half century following the emancipation of the peasants (1861) the consumption of iron in Russia has increased five-fold, yet Russia remains an incredibly and unprecedentedly backward country, poverty-stricken and semi-barbaric, equipped with modern implements of production to one-fourth the extent of England, one-fifth the extent of Germany and one-tenth the extent of America.”

This increased consumption was largely due to the growth of the railways which used many iron rails during the latter half of the nineteenth century. Three-quarters of the iron-smelting was carried on in the Donetz Basin which involved transport over long distances, from the production centres to the areas where the articles were used.

The Donbas industrial region developed rapidly from 1869 to 1917. The iron deposits of Krivoi Rog and the coal of the Donetz Basin were linked by the Catherine Railway and it is of interest to note that a Welshman called Hughes¹ helped in this development. In 1913 the Kharkov and Donetz industrial areas produced almost 70 per cent. of Russia's coal, coke, pig-iron and steel.

The other important iron-producing region was in the Urals, though only about a quarter was smelted here before the Revolution. It was in the Urals that mining was first begun. The Stroganov family developed the salt mines in the sixteenth century and later Peter the Great encouraged mining in order to supply his armies and navy with munitions and other war supplies. It was Peter who sent the Tula gunsmiths to help the merchant Demidov in the development of iron and copper works. The Urals became an arsenal for the young Muscovy as early as the eighteenth century. At one time iron-smelting was quite considerable in the middle of the eighteenth century when Russia smelted almost four times as much pig-iron as England. The iron of the Urals was smelted with local charcoal until the late nineteenth century. Russia soon fell behind after the new inventions of smelting iron with coke had developed in England.

The remaining 5 per cent. of Russia's pig-iron production was to be found in the Moscow and St. Petersburg districts. However, it was these

¹ The oldest steel manufacturing town in the Donbas, the former Yuzovka (now Stalino) was named after him.

self-same areas that were engaged in all the engineering activities. Therefore, much steel and pig-iron had to be sent from the Ukraine, and even some of the semi-finished iron and steel was imported.

Non-ferrous metals. Gold has been mined in the Urals since 1860; later the Siberian area in the Lena valley was to become more important. Copper was also found in the Urals, e.g. at Kungur near Perm, and the bulk of the world's platinum came from here at the beginning of the twentieth century. The chief mining centre was Ekaterinoslav (now Sverdlovsk).

It is interesting to notice that silver was mined in Eastern Siberia at Nerchinsk, near Chita, as early as 1719. Another mining region was found east of Semipalatinsk—this is the area of the Ridder mines in the foothills of the Altai mountains. Mining operations were begun as early as 1727 for silver, zinc and copper. Metal from here helped to make many Russian church-bells and samovars.¹

(b) *Oil.* The Russian petroleum industry began about 1870 and soon developed with the introduction of the internal combustion engine. The chief oilfield was in the Caucasus at Baku. Over 97 per cent. came from this area and the total production in 1913 was about 9½ million tons, the remainder came from Central Asia. At this time Russia exported a third of her oil products.

(c) *Textiles.* Even though Peter the Great was able to produce sufficient munitions, he was dependent on Yorkshire woollen mills to clothe his armies. However, the new fibre, cotton, was introduced in the early nineteenth century, and this tended to replace flax as the basis of the textile industries of the north and central regions. Instead of the textile spinning and weaving taking place in a house or small building, large factories were built and many of the serfs came to work in them during the winter. The growth of the textile industry was assisted by high protective tariffs which kept out the British products. This was especially true when Russia joined Napoleon's Continental System. Raw cotton came from U.S.A. via England to Russia along with English yarn. The textile industry showed remarkable expansion for the number of spindles jumped from 330,000 in 1843, to 6·5 millions in 1900.

The textile industry was no exception to the others, for 95 per cent. of all the spindles and looms were found in the area near St. Petersburg, Moscow and Ivanovo. The latter is situated in the region between the Volga and the Oka (see p. 251). Before 1914 more than half the raw cotton came from U.S.A., while the other half came from Central Asia.

Since the days of Peter the Great, home manufactures or *handicrafts* have been a notable feature of Russian industrial activity. The peasant craftsmen organised themselves on co-operative lines, pooling their resources and sharing the profits. These organisations were called "artels." One cause of this particular type of activity was the long winter days and evenings

¹ A kind of tea-urn used in most Russian homes.

with no agricultural work. Often one town would concentrate on a certain manufacture, e.g. Yaroslavl on furniture and samovars ; Nizhni-Novgorod (now Gorki) on knives and scissors. In certain cases, these had developed into a semi-factory stage by 1917

A steady internal trade developed and cheap cotton goods were sold in the Asiatic countries on Russia's border. The bulk of the distribution of goods took place at the fairs. One of the most important was Nizhni-Novgorod (Gorki), but there were over 200 lesser ones. As we shall see later, communications were not too easy even in 1917. This did not help trade to expand.

✓ Pre-Revolution industry was notable from two further aspects. Firstly, the money used to build factories was foreign owned, chiefly British, French and German. This meant that Russia was a great debtor nation and many of the profits of industry had to be paid to foreigners. Secondly, Russia had to pay for her imports of raw materials and manufactured goods by exporting foodstuffs. These accounted for nearly 70 per cent. and consisted mainly of wheat and other grains. The remainder was made up of wool, flax, oilseeds, timber, iron-ore, manganese and furs. Russia was so backward that she imported machinery and manufactured goods of all kinds. Raw cotton, wool, and even coal, despite her own great resources, remained untapped.

The other striking feature was the concentration of production in large industrial plants, some of which were quite up to date. Over half the workers were in factories employing over 500 people and a quarter in factories with over 1000. By 1914 the industrial workers numbered about 3 million, miners about 1 million, and there were about 800,000 workers on the railways. It was from this body of workers, the proletariat, that the revolutionary party of the Bolsheviks was recruited.

THE EFFECT OF THE REVOLUTION AND THE CIVIL WAR ON RUSSIA

The Revolution altered the whole set-up of the State machine and the Civil War brought down the level of production and the standard of living even below that of 1913. This was only a temporary set back but it is in relation to this level that later progress should be assessed

1. *The Revolution.* 1917

There had been a growing dissatisfaction with the way the Tsars governed Russia for over a century before the power was seized by the Bolsheviks in 1917.¹ As a matter of fact, in the seventeenth and eighteenth centuries

¹ The Bolsheviks (from *bolshinstvo*=majority) were so named because Lenin's followers gained the majority of votes in the second Congress of the Russian Social-Democratic Labour Party in 1903.

there had been peasant and cossack revolts under Stenka Razin (1667-1671) and Pugachev (1773-1775) ; the Decembrist rising by groups of discontented guards in 1825, strikes, and later the revolution which did not succeed in 1905.

In 1914 Russia joined the Allies against Germany. She was called the "steam-roller," and did help to save Paris by drawing off the Germans into East Prussia, even though in doing this she sustained the crippling defeat of Tannenburg. Russia was not economically organised to fight a major war. Wars in the twentieth century needed industries, well-equipped troops and food supplies both for the front and the people at home. In 1916 Russia could not provide these. There were numerous transport breakdowns, bread was scarce, corruption was general, and supplies and munitions were often interrupted. Food riots and strikes began, soldiers deserted, and finally the situation so deteriorated that the time was ripe for the leading party of the organised industrial workers—the Bolsheviks—to seize full powers of government in November 1917. The mass of the people desired peace, bread and work.

2. *The nationalisation of the land*

The first act of this new Soviet government under the leadership of Lenin and the Bolshevik party was to issue a decree which abolished the private ownership of land. It was all nationalised. The larger industrial establishments, the banks, the railways and foreign trade were also placed entirely in the hands of the government. In the country districts, the village soviets, or councils, were given power to arrange for the distribution of land to the peasants. However, as we have noted, both agriculture and industry were at a very low ebb. Land had been left uncultivated because the men were at the front and the factories had suffered under the impact of war.

3 *The Treaty of Brest-Litovsk. 1918*

The Soviet Government saw that further war with Germany must cease and they asked all the belligerents to start talks for peace. The Germans began negotiations and the Treaty of Brest-Litovsk was signed in March 1918. The terms were hard and Russia was to lose the Baltic countries and the Ukraine. Force of circumstances made the acceptance necessary. However, by acceptance a little respite was gained for the young Soviet government to gather its forces and grapple with a disordered and war-torn country.

4. *Civil War and Foreign Intervention. 1918-1920*

Immediately after the Revolution, the allied powers (Britain, France, the U.S.A. and Japan) began to support the anti-Bolshevik forces in Russia. Civil war broke out in the summer of 1918, and British troops landed in

the north at Archangel. In Siberia the Japanese supported the Tsarist troops under Admiral Kolchak. The German armies occupied the Ukraine and spread into the Caucasus. In January 1918 the Soviet Government had to create the Workers' and Peasants' Red Army to fight the Tsarist "White Guards." At one time Petrograd was threatened. Kazan was captured, and the White armies approached within a hundred miles of Moscow. It was during these dark days that Stalin organised the defence of Tsaritsyn. His victory was later celebrated by changing the name of the town to Stalingrad, and it was ironical to see history repeat itself so closely in 1942, when at this same spot Hitler, after defeat in battle, began his long retreat to Germany and eventual doom.

In November 1918 the war ended between Germany and the Allies, but for Russia there was no peace; in 1920 fighting began between Russia and Poland. An independent Polish state was set up by the Treaty of Versailles, but the Polish eastern frontier was in question. With the aid of French armaments and food from America the Poles under Pilsudski occupied Kiev in 1920, but the Red Army counter-attacked and the Poles were driven back to the gates of Warsaw. It was during this period that the now well-known Curzon line came into existence. This was really a language boundary between Poles and White Russians and, south of Brest-Litovsk, between Poles and Ukrainians. The Poles did not accept it, and the final line was settled by the Treaty of Riga in March 1921. This was much further to the east and Poland incorporated a large Ukrainian minority of about 4 million in the Upper Dniester valley as well as many White Russians in the region of the Pripyet marshes. As we now realise, this is still a difficult problem in Central Europe (see Fig. 57).

The Red Army gradually consolidated its position, until in November 1920 Wrangel was defeated in the south and the Crimea was freed. Thus the Civil War petered out, although it was not until August 1922 that Japan left the port of Vladivostok.

During this period (1918-1920) Russia was on a war basis, food was requisitioned to feed the army and the townspeople, all factories worked for the government, rationing was strict and life was hard. This became known as the period of "War Communism."

5. *The New Economic Policy (N.E.P.) 1921-1928*

Civil War and foreign intervention created a multitude of problems, but conditions were even more aggravated in 1921 when a great famine broke out in the Ukraine and Volga region. Many people died and there was great distress. As a result, this was the moment chosen for the introduction of a new system—the New Economic Policy or N.E.P. By this the compulsory delivery of agricultural products to the State was replaced by a modified system of private trading. The peasant was now allowed to sell his grain and other products to the State, or to a co-operative store, or

even to a private trader. The major industries still remained under the State, but small enterprises were allowed to be run by private individuals. Some enterprises like the Lena goldfields were even leased to foreign companies. It was considered by some people to be a departure from the principles of socialism but it was only a temporary measure. It was a period of reconstruction; bridges were rebuilt, factories repaired and the land tilled once again.

By the end of the Civil War (1920) the industrial output had fallen to below the level of 1913, largely as a result of war conditions. Machinery and equipment were worn out; raw materials were in short supply; transport was disorganised; workers were few and untrained. During the N.E.P. period, production from field and factory increased and, in 1926, the output of most commodities was equal to, or greater than, the level in 1913. This gradual return to a higher level of production can be assessed by taking the output in 1921 as 100 per cent.; the 1913 output was 257 per cent. and that of 1926 was 289 per cent. After 1926 there is a very steep rise in the level of production, a state of affairs which has continued to the present day.

Plans for a further change of policy were being laid during this temporary return to private enterprise. Lenin knew that Russia had enormous resources, and in order to build a great and happy state, industry had to be modernised. So too had agriculture. The millions engaged in the production of motor cars, underground railway carriages, cameras, food, blast-furnaces and oil refineries had to be fed. The land had therefore to be made to produce the maximum food. Food and industry are essentials but so is motive power. The modern motive power is electricity. With these ideas in mind, a State Commission for the electrification of Russia was drawn up in 1921 under Lenin's direction. This became known as G.O.E.L.R.O. and provided for the building of large power-stations during a ten- or fifteen-year period. It was no idle plan, for in 1928 Russia was producing two and a half times as much electricity as in 1913.

The next step forward was the launching of the first Five-Year Plan in 1928. By the end of it, production from industry and from the land was not merely to equal that of Tsarist days but to surpass it many times. The aim was "to swap horses," as Lenin aptly put it, "from the sorry, pinched and starved nag bequeathed by an impoverished land, to the fine steed of large-scale industry and electrification." The arrival of 1928 brought with it the beginnings of present-day distributions of people, industries and agriculture which are related to the geographical background of the Soviet Union. These are the distributions which now claim our attention.

Part III: Work

CHAPTER VII

AGRICULTURE

THE TREND OF SOVIET AGRICULTURE

1 *The Change from Subsistence Farming to Collective Farming*

In Tsarist Russia, subsistence farming was the rule; the peasant farmers were only concerned with feeding themselves. There was no surplus to feed others. As Fig. 59 shows, there were about 10 million peasant households eking out a meagre livelihood on half the cultivated area whilst in contrast 28,000 landlords owned and farmed the remaining half. The villages were poverty stricken and not less than $3\frac{1}{2}$ million peasant households had no horse and no agricultural implements. These were hired from the landlord or richer peasants (kulaks), and much of the harvest went to pay for the rent of the land and the other services.

The land was worked in a very primitive way; rye would be sown and later harvested, and then the land would be left fallow. Crop rotation and fertilisers had not yet been introduced. It is small wonder that the yield of the crops was poor and that towards spring the supply of grain was usually very low. Cabbage soup, rye-bread, milk and millet were the main fare of the greater number. Meat was only tasted on feast days and holidays once or twice a year. In Central Russia rye, oats and flax were grown because they provided cheap food and clothing, and there was but little regard for the suitability of the soils.

In the Ukraine and the irrigated oases of Central Asia wheat and cotton were grown as "cash crops." Both were grown to be sold by the land-owners. However, this agriculture was just as precarious, depending on the demand of the world market. The peasant too in these areas could rarely afford the luxury of white bread, for prices fluctuated very rapidly.

During the first ten years after the Revolution there were very few important changes in the countryside. Even in 1928 there were over 8 million peasant holdings, and this third of the people just existed by selling their labour to richer peasants. What was more important, this peasant type of agriculture produced only about one-tenth of the harvested grain needed by the towns. It was inefficient. If more people were going to live in towns and be employed in industry it was essential that the agricultural workers should supply enough food for both themselves and the people in industry.

About 1928, a big drive was made by the Soviet Government to re-organise the farms. Machines could not be used, nor could a planned rotation of crops be grown in small strip fields. The farm programme must be drawn up scientifically and everyone must work collectively. Therefore, agriculture was "collectivised." Of course, this did not take place in one year (see Fig. 60). At first "co-operatives" of the farmers were organised and these marketed the produce from the farms. It was not long before the farmers saw many advantages in working together in a collective farm or "artel."

2. A Collective Farm¹

A number of peasants associated with a certain village decide to set up a collective farm. The boundaries of this new farm are determined by law

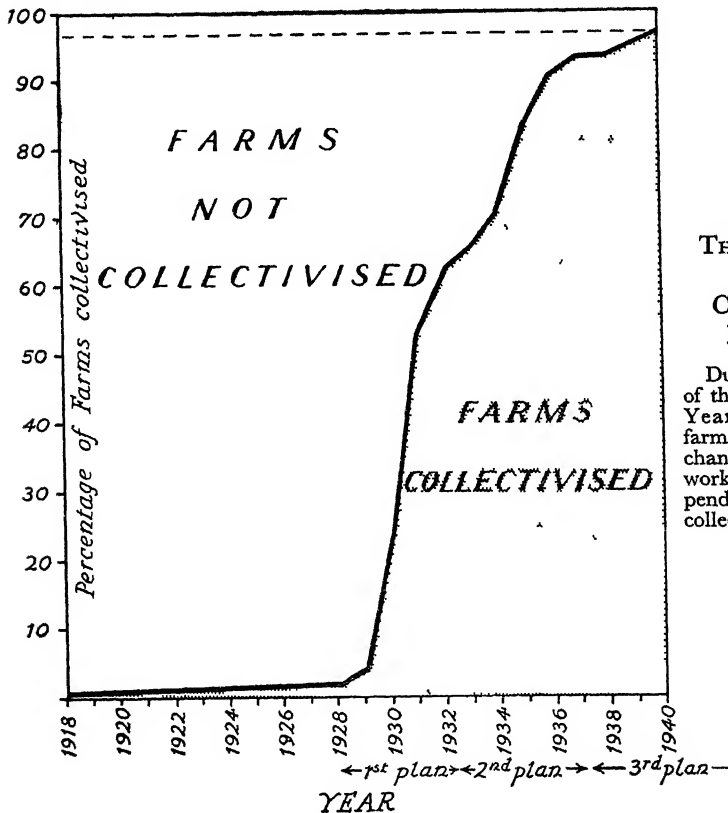


Fig. 60.
THE CHANGE-
OVER TO
COLLECTIVE
FARMING.

During the period of the first two Five Year Plans the farms in Russia were changed from being worked by independent farmers to collective farms.

¹ Russian word is "kolkhoz."

and the State allows them the use of the land for ever. The boundary hedges of the individual peasants are removed, and the farm becomes one unified area.

The cattle, implements, seed supplies and farm buildings do not belong to any individuals but to the collective farm. When a man enters the "collective" his property is valued on a cash basis, part goes into the "sinking fund," as it is called, and the other part ($\frac{1}{2}$ to $\frac{1}{4}$) is his contribution to the farm. He is at liberty to withdraw, and should he do so, his contribution would be returned to him. However, this occurs but very rarely, for in 1940, 96.9 per cent. of all the peasants were collectivised and that included 99.9 per cent. of all the peasant farm lands. The total number of peasant families so organised is now close on 20 millions.

It is important to notice that the individual members of the collective farm have their own personal property. They live in homely cottages, not in some barn-like barracks. The farmer keeps the money he earns, owns his house and furniture, and now he may be the proud owner of a wireless or gramophone. He also has the right to a small plot of land attached to his house on which he can grow vegetables, or keep a cow, pigs or poultry. The size of this plot varies in the different regions. Where land is valuable, as in the irrigated areas of Central Asia, it is small ($\frac{1}{8}$ acre); in other regions it may be as much as $2\frac{1}{2}$ acres. In a dairying region, the farmer is allowed 2 or 3 cows, in a stock-rearing region, this figure can be as high as 5, and a nomadic collective farmer may own 8 to 10 cows with their calves, 10 horses and up to 500 sheep and goats. This is true of the Kazakhstan steppe-lands.¹

Collective farms are run on democratic lines. A general meeting elects the board of management, a chairman and an auditing committee. At this meeting members are accepted and expelled if necessary, the plan and budget are approved, and rates settled. The board of management carry on the business of the farm and these five to nine members meet about once every fortnight to discuss wage-rates, the farm club and the work next to be tackled.

¹ See *What are Collective Farms?* U. A. Karpinski

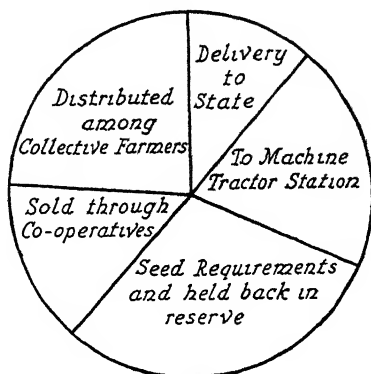


Fig. 61 — THE DISTRIBUTION OF THE PRODUCE AT A TYPICAL COLLECTIVE FARM.

These proportions vary from year to year.

On a collective farm all workers are paid according to the amount and the quality of the work they do. The unit is the *work-day*. This is not just a day's work. One man may work rather poorly for a whole day, and only earn half a work-day, another may be doing complicated and difficult work requiring skill, and he may earn two work-days in one day. It is easy to see that a work-day, or quota, or "norm," will vary in different regions. In some regions agriculture is easy, in others it is difficult. For example, the acreage of land to be ploughed by a man with a plough and two horses varies from $2\frac{1}{2}$ acres to $3\frac{3}{4}$ acres. Each of these norms would be equivalent to one work-day in different regions.

Most work is organised in *brigades*, and the members of each brigade remain the same for a whole season. The size may vary from 30 to 80, and the brigade is allotted a definite area to work, or a certain number of cattle; the brigade is entirely responsible for the results and the equipment. The work is organised by a foreman called *the brigade leader*. He keeps a record of the work done. Good work is always encouraged. Special bonuses are given to brigades if they obtain greater yields. These may be as much as a 10 per cent increase on their total work-days.

✓ Income is obtained from the sale of produce. A certain amount of this has to be sold to the State at a fixed price, and a further quantity is paid in kind to the Machine Tractor Station for work done on the farm. After these commitments have been met any further produce is sold at slightly higher prices through the co-operative markets. Some is held by the farm in reserve for seed or for emergencies, and the remainder is divided among the farmers in proportion to their work-days. As for the actual money: when the farm has paid the income-tax to the State, and repaid any advances, and put a sum in a sinking fund to build houses, clubs and theatres, the remainder is divided among the farmers. For example, in 1938 the Borodin family belonging to the Stalin collective farm in the Southern Ukraine near Genichesk, received 67 tons of grain and 6932 roubles in cash. The gross income of the farm was 3,300,000 roubles—a triple-millionaire farm!

Fig 62 shows a typical collective farm in the Southern Ukraine in a diagrammatic fashion. Here, of course, the stress is on arable crops. Further north there would be more woodland and pasture and the crops would be oats and rye. As we shall see below, collective farms have also been organised in the dry steppe-land where pastoral farming is dominant, and in the Far North they are even becoming important among the reindeer farmers. In all, there are now close on $\frac{1}{4}$ million collective farms, covering over 900 million acres. They each average about 1000 acres of arable land.

In the beginning there was some opposition to the new collective farms. This came mainly from the richer peasants, the *kulaks*. They, themselves, were quite comfortable and cared but little for those who were poorer. Then there was ignorant opposition and that inborn conservative outlook, which hates anything new, to be fought. In order to remove many of these

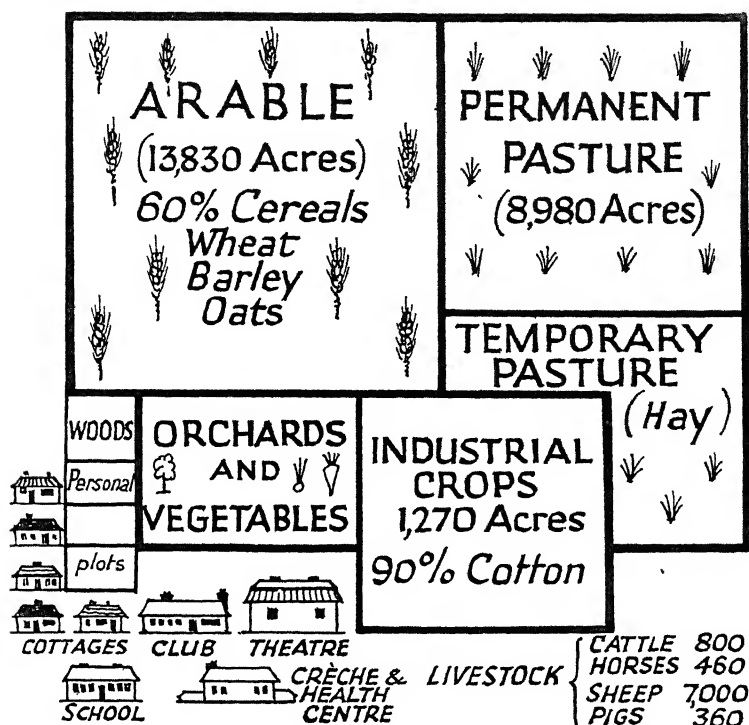


Fig. 62 —A DIAGRAM OF A TYPICAL COLLECTIVE FARM.

obstacles to progress and to show peasants the advantages of large-scale agriculture and machine methods, the government organised large State grain farms. These also ensured a supply of food for the towns.

3. A State Farm¹

On a State farm the people work more like the workers in industry. They farm the land, or tend livestock, working an eight-hour day. They also have an annual holiday with pay. The first State farms were large grain-growing farms,² followed by large-scale stock-rearing farms. They tend to be very large, using extensive machine methods for all the farm operations. By 1930 there were already 143 State grain farms. This

¹ Russian word, "sovkhoz"

² The State farm called Gigant (Giant) is the largest farm in the U.S.S.R. and in 1936 had over 54,000 acres under wheat. This is situated in the Salsk steppes south-east of Rostov, and in 1930 covered nearly half a million acres.

1928

Total-290,400,000 acres



1935

Total-341,229,000 acres

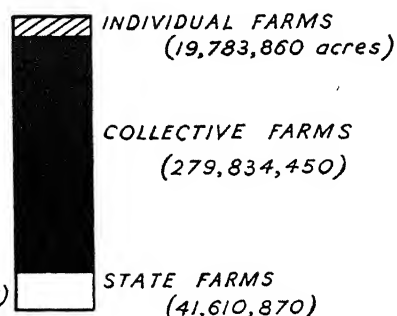


Fig. 63.—THE SOWN-AREA OF LAND AS CULTIVATED BY DIFFERENT TYPES OF FARMS IN 1928 AND 1935.

This diagram shows that the acreage of land under cultivation has increased since 1928 and that the number of individual farms showed a very marked decline during this period. Collective farms are now by far the most numerous.

number had increased in 1939 to 3957 State farms occupying 168 million acres. They are to be found in all regions. Some specialise on grain, others on cattle, pigs or sheep-rearing. There are farms which concentrate on cotton, citrus fruit or market gardening; others are specially designed for breeding reindeer and fur-bearing animals. These farms do not cover so large an area nor are they so numerous as collective farms, but their importance is seen from the facts that in 1938 they had a sown area of 30 million acres and kept 2,597,000 cattle, 1,830,000 pigs and 5,676,000 head of sheep. The number of workers employed is over 2 million.

The "steel-horse," or tractor, has made it possible to till these millions of acres, many of which were previously neglected, or were simply virgin land. Most of these tractors, which numbered 483,000 in 1938, are of the large caterpillar type, whilst Diesel tractors and those with gas-generators are becoming more numerous. In 1938 there were over 150,000 combine-harvesters and over 195,000 motor lorries used in transporting grain, meat, milk and other supplies to the people and factories of the towns.

In 1939, the author saw a State farm for market-garden produce near Moscow. This grew onions, tomatoes and other vegetables for the Metropolis. Also, at this farm was seen a weird-looking machine, worked by electricity, which was like the cab of a motor-bus. It ran on lines on either side of a long seed-bed. This machine was able to carry out some twenty different processes and was worked by one man who was surrounded by levers and gadgets. He could sow, water, fertilise, thin-out and gather

the seeds and seedlings, whichever operation was necessary. Such a machine would have been expected rather in the U.S.A. than in the U.S.S.R.

It has been pointed out that both types of farms in the Soviet Union now use an increasing number of machines. Before the Ukraine was invaded by the Nazis the agricultural machinery plant at Rostov was producing more farm machines per year than did all the factories in Tsarist Russia

4. *Agriculture and Industry march in step*

The growth of Soviet industry has only been possible because agriculture has been able to produce the food and raw materials (e.g. wheat, cotton and rubber). On the other hand, the increased output of agricultural products would have been impossible without the manufacture of fertilisers, electricity and machines by Soviet industry. Thus the grain harvest before 1917 never exceeded 80 million tons, while in 1940 the harvest reached 119 million tons. This represents an increase of almost 50 per cent. in twenty-three years.

The tractor and multiple-share plough has replaced the old wooden plough and harrow, drawn by a bony ox; and the combine-harvester has replaced the flail and scythe.

However, Soviet industry does not supply the machinery to the farms direct. The equipment is concentrated in *Machine Tractor Stations*. These began quite accidentally when in 1927 the Taras Shevchenko State Farm organised a tractor team to help other farms. It was not until 1913 that the first tractor was seen at the Kiev agricultural exhibition and this was of American manufacture. The Rostov factory began production in 1930, and in that year there were 158 machine and tractor stations, compared with over 7000 in 1940. These stations are entirely financed by the State and do not have farms of their own. They satisfy the needs of the collective farmers for agricultural machines. Each station serves about thirty collective farms, and they work on the basis of a definite contract. The station undertakes to do a certain task, e.g. autumn ploughing, by a definite date; and the farm provides in its turn labour and perhaps animals for hauling supplies of fuel for the tractors or combines.

The machine and tractor stations train tractor drivers and service their own equipment. They also have skilled staffs of book-keepers, engineers and agronomists, who advise the farms on topics like land-reclamation, crop rotation and any other farming problems. The average equipment of each station includes about 90 tractors, 25 combine-harvesters, 14 threshing machines and other equipment like drilling machines and cultivators. It must not be thought that the Russians have indulged in mechanisation for its own sake; it means that one man can now do the work of hundreds of peasants with their former primitive farm-technique. As an example, one

combine harvester reaps about 760 acres in a season. Some skilled workers, *Stakhanovites* (see p 199), like the Oskin brothers of the Ilel machine and tractor station near Chkalov (Orenburg), have harvested 13,320 acres in one season, with two combines drawn behind a 60 h.p. tractor from the Chelyabinsk plant (Urals). To do this work with simple machines would have employed over 1600 men and over 350 horses

One of the common bonds linking modern agriculture with industry is electricity. This is the new motive power used for artificial milking machines in the dairying regions, and for lifting water where irrigation is practised. Many chopping and threshing machines are now worked by electricity, and large arc-lights have been used when it was essential to complete harvesting after sunset. In many regions electricity is becoming the source of heat for hot-beds and greenhouses

Not only has industry given new machines to agriculture, but it has also given fertilisers. Strangely enough the new source of phosphate fertilisers augmenting supplies from the Ukraine is the formerly barren land in the Kola Peninsula south of Murmansk (see p. 233) Many



Plate 26.—HARVESTING IN THE UKRAINE WITH A DOUBLE-HITCH COMBINE.

Extensive methods of farming are now used in the former steppe-lands of the Ukraine. These flat plains, reminiscent of the prairies of Canada, favour the use of tractors and combines which cut and thresh in one operation, the grain can be seen falling into the lorry which moves alongside.

of the by-products of the metallurgical industry provide useful plant-foods. In 1938 industry supplied nearly four million tons of fertilisers which contrasts with the 140,000 tons in 1913.

5 *Application of Science to Agriculture*

The dominant keynote running through the whole of Soviet agriculture is the application of science. It is science which has given complicated pieces of machinery, and science which has evolved new varieties of seed, and science also which has turned former deserts into now fertile areas. Plants have been developed which are better adapted to climate and to soil, for it must be remembered that except for relatively small areas the U.S.S.R. is not endowed with good soils nor with extremely favourable climates.

(a) *The change from Mono-culture to a balanced Agriculture*

It was pointed out above (p. 133) that European Russia, south of a line from Kiev to the Urals, was the "producing" region. This used to be the former steppe-land of black earth which grew acres of wheat throughout the nineteenth century. It was 95 per cent. arable land. North of this line lay the "consuming" region of the Moscow region. Here the black earth was replaced by poorer "podsol" soils: a region of swamps, mixed woods, and fields of rye, oats and flax. Both these regions were practising bad agriculture. Not even the fertile black-earth region could remain rich for ever. The wealth of the region was exported with the wheat and nothing replaced it. It is also dangerous to have "all one's eggs in a single

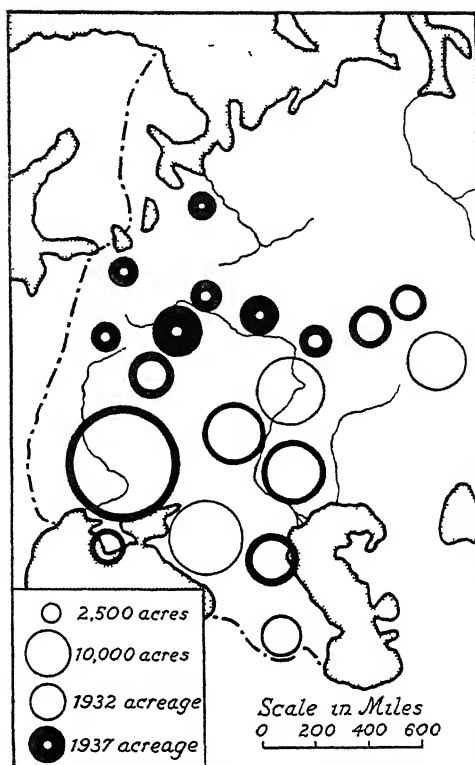


Fig. 64.—THE NORTHWARD MARCH OF WHEAT CULTIVATION.

The white inner circle shows the acreage under wheat in 1932 and the blackened circle shows the increased acreage in 1937. Thus in proportion the expansion in wheat-growing has been greater in North and Central Russia.



Fig. 65 —LUCERNE (*Medicago sativa*).

A leguminous plant which is universally grown in the temperate regions as a fodder crop. It is planted in rotation with cereals in the Ukraine but with cotton in Central Asia. Two or more crops in one year may be obtained. This plant is also called *alfalfa*, but must not be confused with alfa which is the same as esparto grass.

a poor yield always proved disastrous to the peoples of the region.

Since the First Five Year Plan of 1928–1932 agriculture has become more balanced. Thus the tendency has been and still is for regions to grow their own food-crops. This saves transport, always one of Russia's main problems. Several crops grown in rotation can help to maintain soil fertility and at the same time supply the region with food and with technical crops for local industry. Clover and hay can also fit into the scheme of rotation and supply food for livestock which in turn provide meat, milk and manure

Wheat is now being grown farther and farther north (see Fig. 64), and rye, the poor man's cereal, is being replaced. Clover now follows

basket" The Ukraine and Volga lands often have just too little rainfall in the spring and early summer and in the past this meant famine. As is now being realised in U.S.A. and Australia, it is dangerous to plough up former grasslands without paying heed to the drainage pattern, the slope of the land and the rotation of the crops. Heavy storms often lead to gullying action and many ravines have developed in the Ukraine, where in places trees are now being planted instead of wheat to prevent further soil-erosion.

In the north, flax, a technical crop, was grown although the region itself was deficient in food supplies. By the time spring arrived, all the rye had usually been eaten and so wheat had to be brought from the south. The price of this was raised by transport and was often too high for the peasants in the north to afford.

Mono-culture was the rule in Central Asia. This was the only region which supplied Tsarist Russia with cotton, and then nearly half her requirements had to be imported from America and Egypt. Some wheat was grown on these irrigated lands which was really a most wasteful use of valuable land. Here again a slump in the demand for cotton or

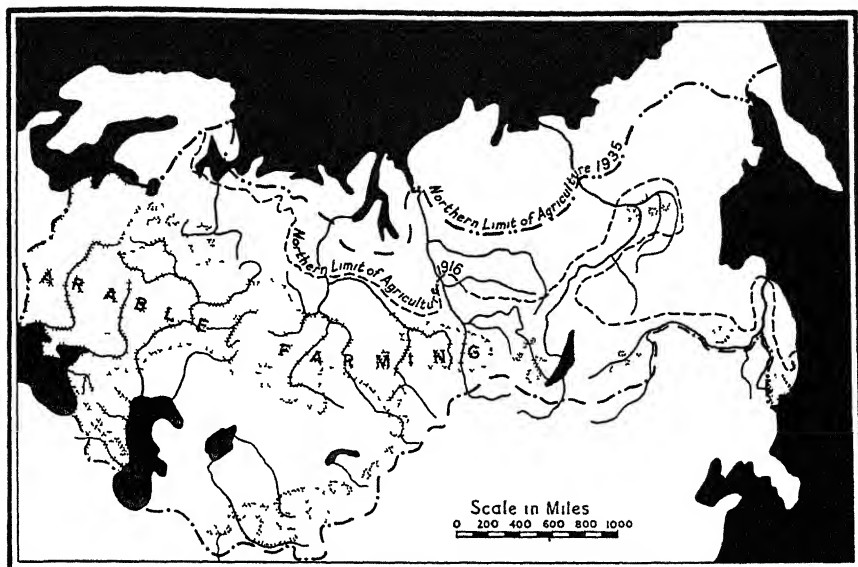


Fig. 66.—THE AREA UNDER ARABLE FARMING.

The area under plough-land is mainly in the west and there is an extension eastwards along the line of the T.S.R. (see Fig. 123) Notice the similarity of this map and Fig. 130

flax which is a most exhaustive crop, making heavy demands on the soil.

Before the Revolution about $\frac{1}{2}$ million acres of wheat were grown in the non-Black Earth regions, a figure which had reached over 7 million acres in 1939. Although the Ukraine, Western Siberia and the Pre-Caucasus are still the main wheat-growing regions the new areas are to be found in the Upper Volga lands and the Moscow and Leningrad regions. These are no longer dependent on the south for their loaf of bread. Similarly Western Siberia does not normally supply Moscow with wheat, oats and butter, but has an agriculture linked with the new industrial regions of the Kuzbas and Karaganda (see p. 221).

In Central Asia cotton is still the major crop on the irrigated lands but lucerne occupies an increasing acreage and figures largely in the crop rotation, serving as food for the animals. The wheat is restricted to the non-irrigated areas at the foot of the mountains of Central Asia in the pockets of former steppe-land. However, cotton is now no longer restricted to Central Asia, for non-irrigated varieties are grown in the Southern Ukraine and in the valleys of the Kura and Araxes in the Caucasus region.

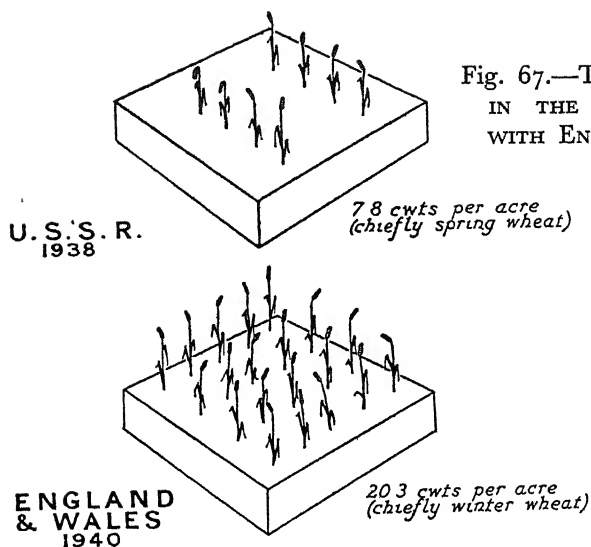


Fig. 67.—THE YIELD OF WHEAT IN THE U.S.S.R. COMPARED WITH ENGLAND AND WALES.

The yield of wheat in the U.S.S.R. is low when compared with that of England and Wales. Farming in Russia should be compared with regions like Australia, Canada or Argentina which use similar extensive methods. British farming is much more intensive and is almost akin to gardening [Note these are gross figures]

- (b) *Area under crops is being extended*
 (i) *By the introduction of new types of seed*

In the short space of time between 1916 and 1935 the line showing the northern limit of agriculture has moved very much nearer the Pole. At long last the cold desert has been invaded. Science has helped in evolving frost-resistant types of plant, which will now grow in this formerly uncultivated third of the country. Both State and collective farms have been established well within the Arctic Circle, in the Kola Peninsula and in the Lower Yenisei valley. Thousands of tons of potatoes and other vegetables are being grown where once there was only barren tundra.

Although the number of frost-free days may only be 90 in a year, there is perpetual daylight for 24 hours a day around the northern summer solstice (21st June). This partly compensates for the low noon-altitude of the sun and the short summer (Fig. 21). Crops like oats and vegetables can be grown outside even though the subsoil is frozen a little below the surface.

An increasing acreage of grain crops are being sown with seeds which have been "vernalised." This process was evolved by the Soviet scientist *Lysenko*. He showed that if seeds were subjected to a slight increase of temperature and moisture before planting, they would sprout several days earlier when eventually they were put into the ground. This, therefore, allowed seeds which may require 110 frost-free days to be grown in areas where there is only 100 frost-free days on the average. Winter varieties of

wheat can now be grown in areas which have until recently sown spring wheat ; this is of great importance for the Ukraine (see p. 176).

Vernalisation has been shown to increase the yield by as much as $1\frac{1}{2}$ cwts per acre. In 1938 the area under these " vernalised " seeds had reached over 24 million acres, and this new process is now being applied to sugar-beet, cotton and potatoes, in addition to certain cereals.

New methods of seed selection are also being devised. This work is done by growing self-fertilising plants on seed-plots in a nursery, selecting the desired type and then sowing it on a wider scale. Another scientist, *Yefremov*, has shown that the yield of crops per unit area can be increased by finding out the best, or optimum, number of seeds to plant on any given area. He carried out his experiments on little plots where he measured very accurately the distance between each seed, and then checked the varying yields

Yefremov demonstrated that it was possible, though not expedient, to grow 850 to 1000 fertile wheat-plants on one square yard of land. This most certainly throws new light on an important subject, for the yields of the majority of crops in the U.S.S.R. have in the past been low when compared with other regions. This is a fact common to all regions employing extensive machine methods. British wheat-growing with its high yields is more like gardening, when compared with the wheat lands of the Ukraine or the prairies of America.

Table 2
GROSS YIELDS

	Year	U.S.S.R.	England and Wales	
		Cwts. per acre	Year	Cwts. per acre
Grain . . .	1913	5.9	—	—
Wheat . . .	1913	6.8	—	—
Spring wheat .	1937	7.6	—	—
Winter wheat .	1937	10.4	1944	20.3
Wheat . . .	1938	7.8	1942	20.4
Oats . . .	1938	7.6	1942	15.6
Rye . . .	1938	7.2	—	—
Barley . . .	1938	7.8	1944	18.2
Maize . . .	1938	9	—	—
		Tons per acre	Tons per acre	
Potatoes . . .	1913	3	—	—
Potatoes . . .	1938	3.8	1944	7.1

The author visited the All-Union Agricultural Exhibition in Moscow during 1939 and saw the interesting work carried out by the scientist *Tsitsin*. Along with other scientists, *Tsitsin* has been engaged in trying to

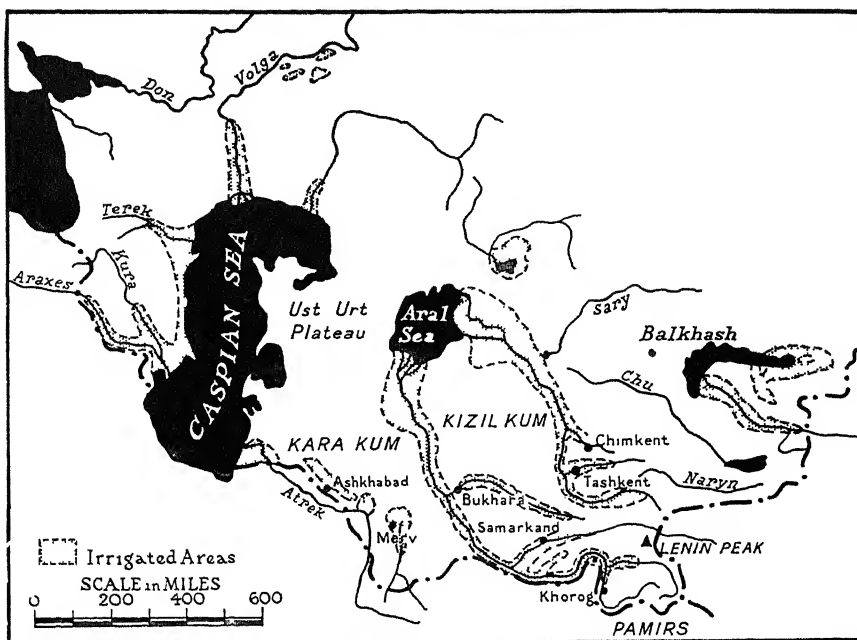


Fig. 68 —THE IRRIGATED LANDS OF THE SOVIET UNION

The irrigated lands are to be found in the south-west. This is, of course, the region which is deficient in rainfall and many of the irrigated tracts are oases in the desert. Many of the new dams are used for irrigation as well as for the generation of hydro-electricity.

find a perennial type of wheat which will grow again after reaping, and yield from seven to eight harvests from one sowing. A yield of as much as 19 cwts. per acre was obtained from one of these varieties in the rather unfavourable climate of the Moscow region in 1938. This new type had been evolved by crossing cultivated wheat with wild couch-grass, one of Britain's worst weeds. In 1939 these developments were only in an experimental stage as there were difficulties in harvesting. It is therefore necessary to put these scientific developments in their true perspective. Nevertheless, they do open up a new field of research and will be a great boon for regions where labour is scarce.

(ii) *By irrigation*

New varieties of plants have helped man to invade the cold-desert regions and to extend the area under crops, but a second method has been used to attack the hot deserts. This method is *irrigation*. When water is brought to these hot regions they can be made really fertile. Irrigation

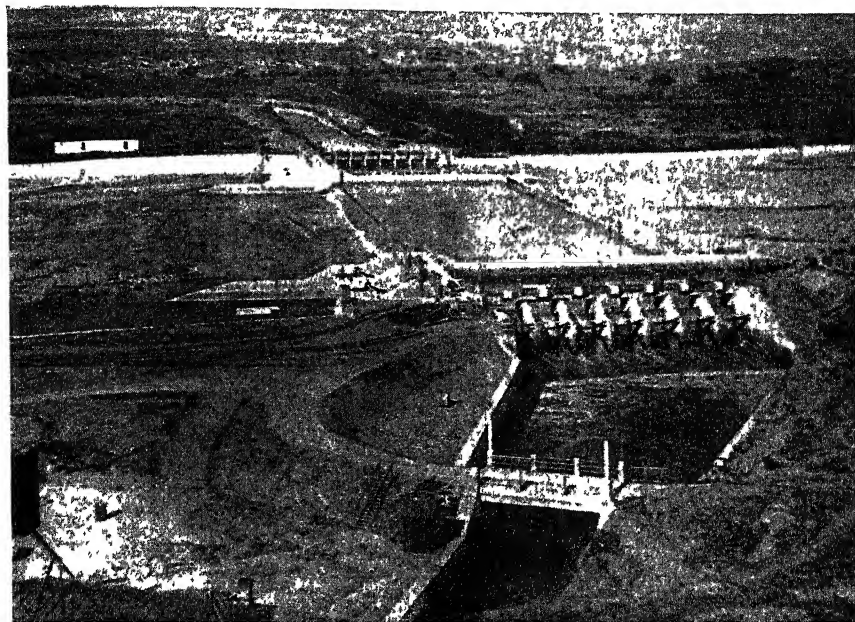


Plate 27.—YANGI DARGIN IRRIGATION CANAL, UZBEKISTAN.

About half the land under cultivation in Uzbekistan is irrigated. Many new canals like the one illustrated have been built. They are modern concrete projects which are often related to hydro-electricity installations.

was practised many centuries ago in the oases of Samarkand, Merv and Bokhara, so the idea is old but the scale on which it is being done is very different to-day.

It is not always realised perhaps, that there are such extensive hot deserts in the Soviet Union. On the left bank of the Lower Volga and in the Aral-Caspian Depression of Central Asia, there is a tract which has less than 8 inches of rainfall a year, and comprises in area, one seventh of the U.S.S.R. Although the winter temperatures are low, the summers are the hottest in the Soviet Union. The air is dry, and there is abundant sunshine. However, in summer the snow and glaciers melt and rain falls in the high mountains to the south of this region. These waters feed the Syr and Amu-Darya, two rivers which manage to flow across the desert and so reach the Aral Sea. They are the "River Nile" of Soviet Central Asia.

Before the Revolution, the area which was irrigated amounted to about $10\frac{1}{2}$ million acres, that is about one-sixth of the area of the British Isles. Thus it was quite a large area. The methods which were used were most

primitive. Where the river water was at no great depth below the plain, it was tapped by a main canal. This would be closed by a simple dam made of wicker and earth and whenever the time came for closing or opening this dam, the help of thousands of peasants would have to be called. The main canal would be divided into minor channels so that each individual field had its little ditches filled with water. If the river was slightly entrenched, then the water had to be raised by wooden water-wheels, called "chigirs". It will be noticed that these methods are reminiscent of Egypt and the East. They were inefficient, and the peasant had but little produce left for himself after paying rent and other feudal dues in produce and labour. The irrigation water and the canal system had to be rented from private owners. The situation is very different to-day.

Now, millions of acres of freshly irrigated land have been brought under cultivation. These new schemes are to be found in Central Asia, as well as in the Caucasus region and along the Volga. Perhaps the best example is the now famous Ferghana Valley Scheme (see Fig. 140). In 1939 the local collective farmers decided to dig a canal through the valley and so distribute the water-supply more evenly. The eastern end was frequently swampy whilst the western end only had water after the snow had melted in the neighbouring mountains. Over 160,000 farmers, helped by women and older children, turned out, and in the record time of 45 days the canal was completed; a canal which measured 220 miles! It was looked upon as an honour to volunteer to work on the canal or its branches, which soon covered the valley. Now the fertility of the valley is shown by shady walnut and pistachio groves, orchards of apples and about 37,000 acres of sugar-beet, and 160,000 acres of cotton.

On the other side of the Tian Shan mountains rises the Chu River which finally loses itself in the drier steppe of Kazakhstan. In the Upper Chu the Chumysh dam provides irrigation water for more than 100,000 acres, and incidentally is used for the generation of hydro-electricity. There is also in Uzbekistan the Dyz-Ket-Ken canal and the Kum-Kurgan system on the Surkhan-Darya (River). A little to the east of Bokhara a dam is being completed in the Katta-Kurgan valley. It will be occupied by an artificial lake, which is going to be larger than Lake Meade behind the Boulder Dam in U.S.A. In 1942 a start was made on the Northern Tashkent Canal which is destined to irrigate over 100,000 acres.

During the Second Five Year Plan (1933-1938) a new scheme was constructed in the heart of the Pamir region in the mountainous republic of Tadjikistan. This is in the valley of one of the headwaters of the Amu-Darya, called the Vakhsh. Here another 100,000 acres of cotton land lies in an intermontane valley protected, like Ferghana, from the cold north winds of winter.

Just to the north is Zeravshan valley down which the old Silk Road from China ran towards Bokhara and Samarkand.

" In the Zeravshan valley rice is cultivated up to an elevation of 4000 feet, corn (maize) to 4300 feet, peaches to 4600 feet, grapes to 5900 feet. Above 6200 feet no grain can be grown in the Swiss Alps ; yet in the Zeravshan valley millet is cultivated up to elevations of 6400 feet, apricots to 6900 feet, and barley above 8000 feet. The snow-line on the northern slopes is around 12,000 feet—higher by 3000 feet than it is in the Alps. The foothill approaches to the Pamirs are covered with apricot, almond, walnut, pear, apple, cherry, fig and date orchards, or with vineyards. Stately Tian Shan fir trees, which sometimes grow to a diameter of 6 feet and a height of 200 feet, cover the northern slopes except where clearings have been made for fruit trees." ¹

In the neighbouring republic of Turkmenia to the west, streams flowing northwards from the Turkmeno-Khorosan mountains are also used to bring the valuable water to the parched land. In some cases the streams are canalised into a concrete channel and then led into reservoirs. These are found ² along the River Murgab, near Merv, while another big reservoir is being built along the River Tedjen. So much has been done, but there is another bigger and grander scheme to increase the cultivated area in what is now the Kara Kum desert. This is a task for the future and falls into three parts, which are all concerned with the Amu-Darya and its now forsaken old channel called the Uzboi, which flowed westwards across Turkmenistan and had its outlet in the Caspian Sea near Krasnovodsk. This plan is to irrigate an area of 1½ million acres by digging a 300-mile canal with many branching channels. When it is realised that the republic of Turkmenia consists of 95 per cent arid and sandy desert, this projected "Soviet California" will be a great asset when completed. However, a start has been made, for in 1940 some of the water from the Amu-Darya was taken by canal into the eastern end of the Uzboi and helped to fill seven large depressions which will act as natural reservoirs. Water will also be taken from the Amu-Darya into the Western Uzboi and finally the lower reaches of the Amu-Darya will be used to extend the oases near Tashau.³

There is a most interesting research station in the Kara Kum desert at Repetek which was founded as early as 1912. Many interesting experiments are proving that plants can be made to grow in a desert. Dunes are being stabilised by the cultivation of grasses and bushes which bind the sand grains together with their roots. Other areas are being planted with the saxaoul tree. This is quite a grotesque tree with curious zig-zag branches. Its natural slow growth has been speeded up by propagating new trees from cuttings and in 1942 thousands of tons of fuel were obtained

¹ *Soviet Asia* by R. A. Davies and A. J. Steiger

² There are the following systems in Turkmenia : the Voluev and Barsig-Kerkor canals, the Tashkepru Dam and the old Kaushut-Bentsky system is now repaired

³ See *Anglo-Soviet Journal*, Vol VI, No. 1

from the saxaoul plantations. Considerable success has been achieved in the desert region by digging long trenches with sloping sides. At the bottom of these, thin layers of good soil are placed, and many types of vegetables and root crops can now be grown. This method of cultivation shows that the water-table is not everywhere at great depths below the surface.

The effect of all these new works has been to increase the area under cultivation in the Turkmenian Republic from 600,000 acres to 900,000 acres between the years 1925 and 1937.

The irrigation systems of Transcaucasia, like the Samur-Devichesky canal, the Sardarabad, Alazan and Ordzhonikidze systems, are to be found associated chiefly with the Rivers Kura and Araxes in the republics of Azerbaijan and Armenia. The extension of new arable areas is not the sole concern of these schemes, for the barrages and artificial lakes are also used to generate hydro-electricity. In some cases these schemes have led to an improvement of water transport, fishing facilities and the water-supply to new industrial enterprises.

The same type of story is told by the "Great Volga Scheme" (see p. 214). Dams have been constructed along the Kama and Volga Rivers which will be used for the generation of hydro-electricity, for irrigation and to improve navigation. One reservoir near Kuibyshev, and the other south of Saratov, at Kamyshin, are going to irrigate 10 million acres of land in the near future. This region lying on the left bank of the Volga, between Kuibyshev (Samara) and Saratov, comprises the former dry steppe-land where many famines were experienced in the past. It is difficult to estimate how near the various schemes are to completion, but in 1936 the Elshan Dam on the Samara River was finished and supplied water to four collective farms. In another area near Pugachev about 18,000 acres were irrigated in 1938 by using another small left-bank tributary of the Volga called the Great Irgiz. Earth embankments, dams and pumping stations, with scores of intersecting irrigation canals are now to be seen with their banks lined with trees. The effect of supplying this region with water has been seen in the increased height and yield of the wheat. This result is particularly noticeable in years of drought like 1935 and 1936. In 1936, actually an unfavourable year, the yield of irrigated fields was ten times that of non-irrigated areas, in some of these regions along the Volga.¹

The Volga scheme was planned to be completed in the course of 15-20 years. The first plan to irrigate 2½ million acres was due to start in 1947, but much of the work has been inevitably retarded as a result of the Second World War.

¹ In the collective farms of the Kuibyshev Region in 1936 the average yield of spring wheat was 18 cwts. per acre on the irrigated land but only 1.6 cwts per acre on the non-irrigated land. See also *Anglo-Soviet Journal*, Vol. I, No. 1, "The irrigation of the Trans-Volga Region."

(iii) *By dry-farming*

By the introduction of the *dry-farming* methods, the cultivated area has been further extended in the region of low precipitation along the lower Volga and in Northern Kazakhstan. Dry-farming is a method of retaining soil-moisture and reducing loss through evaporation by working the soil into a very fine powder, or tilth, at the surface. This prevents the formation of large cracks and acts as an insulating layer which keeps the moisture in the soil, for loose soil, being full of air-spaces, is a bad conductor. Of course dry-farming entails a good deal of ploughing and harrowing to break up the larger clods of earth. This helps also to kill the weeds which are extravagant users of soil-water.

The effect of the many large air-spaces in the soil is to prevent the formation of countless hair-like channels of moisture from subsoil to surface. These films of moisture are continuous in compact and hard soil, and lead to big losses through evaporation, but the frequent harrowing breaks this continuity and therefore conserves the moisture. To put it simply: the compact soil left untilled is like a blot which would spread in all directions if placed in the centre of a pile of blotting-paper sheets, whilst the soil after dry-farming is like a blot which can be prevented from spreading upwards by separating some of the top sheets. It is only the surface soil which is left loose, for an implement called a "subsoil packer," a kind of roller, is frequently used to pack a light sandy subsoil. In a region where the moisture of one season is insufficient to grow a crop every year, by employing dry-farming methods it may be possible to grow one every two or three years. Dry-farming retains the rainfall and snow-melt of two or three years, and as it were, adds them together making the final total sufficient for one crop. Another help in preventing soil erosion and conserving snow-melt is "contour ploughing." As the term suggests, the furrows are made to follow the contour. Thus the run-off is impeded and a furrow cannot serve as the source of a possible gully after a rainstorm.

(iv) *By drainage*

Just as new land has been added to Soviet agriculture by bringing water to the dry regions, so the reverse process has been undertaken. Wide stretches of former peat bog and marsh have been reclaimed by *drainage*. Across the north of the U.S.S.R. a disconnected belt of marshland stretches from White Russia towards the Far East. There are many regions of indeterminate drainage, often near watersheds. A great number of these were occupied by lakes during the later stages of the Ice Age. Perhaps the best example is the Pripyet Marshes in White Russia. This is a desolate area of marsh, lake and waterfowl, covering an area of close on 5 million acres and measuring over 100 miles from east to west. It is called "Polyessie." Attempts have been made to drain part of it. In fact, most



Plate 28—A VINEYARD IN THE FERGHANA VALLEY

Citrus fruits are now most important in the warmer southern areas of the Soviet Union. Grapes, peaches, apricots and oranges are grown in the Central Asian Republics and the Caucasus. Notice the strongly Mongoloid features of this girl and the very flat face.

reminiscent of the Muskeg swamps which were encountered during the construction of the C.P.R. across Canada. Difficult though the work may be, much progress is being made in the U.S.S.R.

Along the Azov and Black Sea coast, especially in Georgia, over $\frac{1}{2}$ million acres have been drained. Formerly these marshlands of the Kuban River

reclamation work has been carried out in White Russia, and the soils of the marshland have been found to be more fertile after drainage than the podsolised soils of the sandier and better drained ridges in the same region. These reclamation schemes increase the area of grassland as well as making it possible to grow flax, hemp, vegetables and wheat. In addition, new waterways are made, new fisheries are produced, and often peat-works established to supply fuel for electric generating stations (see pp. 202 and 212).

Both the Leningrad and Moscow regions have large areas of marshland where new agricultural land and peat-works are being created. Perhaps the most extensive stretch of such land in the world is in Western Siberia in the middle and lower Ob basin. This marshy area is

and the Kolkhiz district south of Tuapse were the breeding-grounds of malaria ; now the fertile, silty soil grows valuable subtropical crops and citrus fruits. The work of reclamation is carried out by constructing embankments and digging drainage canals. Eucalyptus trees are also planted. They absorb much moisture. Furthermore, the mountain streams bringing flood-waters are intercepted before they flood the lower plain, and are led into the sea by means of artificial channels.

(c) *The development of fruit-growing*

Before the Revolution very few fruit trees were grown in Russia. The reason was chiefly climatic. Only the favoured regions of the Black Sea coast, the Southern Ukraine and Central Asia were suitable for warm- and

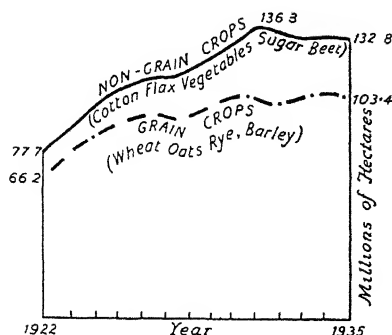


Fig. 69.—THE INCREASE IN AREA OF BOTH GRAIN AND TECHNICAL CROPS.

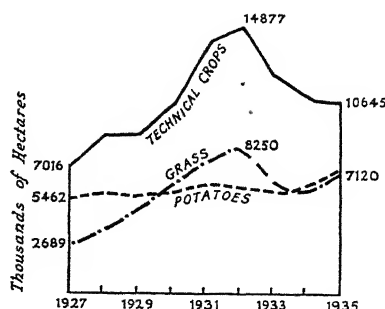


Fig. 70.—THE GROWTH IN IMPORTANCE OF TECHNICAL CROPS.

cool-temperate fruits. However, science has again come to the aid of the Soviet Union in this branch of agriculture. In this connection the name of the late Michurin is all-important. He cross-bred hardy, wild varieties of fruit trees which he found in Siberia, Canada and in the mountain regions of Russia with the cultivated varieties. Those which inherited the hardy characters of the wild variety and all the tastiness and size of the cultivated were kept. In this way a great number of new varieties—over 300—were bred. As years go by, the northern limit of fruit-growing is being pushed farther and farther north ; it now reaches right into the Leningrad region in latitude 60° N. Vines can now be grown as far north as the line joining Kiev-Voronezh-Kuibyshev and the south Urals.

Not only has Michurin increased the power of resistance of some fruits to the harsh climate, but he has also evolved new and quite original fruits by crossing the cherry with the bird-cherry, the pear with the mountain ash and the apricot with the plum. Fruits enter the diet of the Soviet



Fig 71 —KOK-SAGYZ

This is a variety of dandelion which is grown for the high-grade rubber. It is now extensively grown from White Russia to the Central Asian Republics.



Fig. 72 —GIANT SORGHUM
(*Andropogon durra*).

A tall maize-like grass which is now extensively grown in the oases of the Central Asian Republics. It is suited to rather a dry climate but is also grown under irrigation conditions. Sorghum is grown for its grain, as a fodder crop, for sugar or to make into brushes and carpet brooms.

worker for now there are over 3 million acres of orchards in the U.S.S.R. Apples are grown particularly in the Western Ukraine, near Kiev, and in the Voronezh area, where the important railway junction of Kozlov has been renamed Michurinsk to commemorate the work of this great Soviet scientist. The favourite apple grown here is a bright red one called "Saffron Pippin." Michurin's¹ apples have even crossed the Urals. In 1944 there were 17,500 acres of orchards in Siberia, despite the very low winter temperatures. Some of these are "creeping orchards," that is, apple trees grown horizontally close to the ground so that the winter snows offer some protection and wind-damage is avoided.

Vines, apricots and citrus varieties are grown in the Mediterranean region of the Black Sea coast, near Odessa, the lower Don, the Crimea

¹ The type of apple most grown in Siberia, however, is named after Professor Kizurin, and it can produce as much as 150 lb of fruit on one tree.

Plate 29.

RUBBER FROM
DANDELIONS.

Fields of Kok-Sagyz are to be found in White Russia, the Ukraine and in Central Asia. This photograph shows the seeds being collected in a kind of carpet-sweeper machine. The actual rubber was at first obtained by crushing the plant, now it can be taken from the seeds or by making incisions in the root and collecting the latex, or rubber juice, at the surface



and in the Caucasus region and, of course, in Central Asia. Alma Ata, the administrative centre of Kazakhstan, has developed into an important orchard growing country at the foot of the Altai mountains. Its name means "Father of Apples," and there are over 20,000 acres of apple orchards which contrast with the "hungry steppe."

(d) The introduction and development of new plants

Before the last decade or so, Russia had been poor in the number of species of plants that were of economic importance. The bulk of the plants were food crops ; rye, wheat, oats, barley, potatoes ; with the two fibres, cotton and flax. However, the rapid expansion of industry since the First Five Year Plan (1928) has created an increasing demand for technical or industrial crops. Raw materials like rubber, vegetable oils, dyes, cork and more vegetable fibres are now required. The policy of the U.S.S.R. has been to grow things for herself rather than be dependent upon imports. In a world which is economically unstable this is most desirable as we in Britain have found in times of war. To the foresight of the Soviet Union, we, and they, owe much.

Like Britain, the Soviet Union has nowhere a climate suitable for growing the rubber tree of the equatorial forests and so other plants were tested to see whether they would yield a rubber-like substance. Three such plants were discovered by Soviet scientists in 1931 in the Tian Shan group of mountains on the borders of Central Asia. They have been called

Tau-Sagyz, *Kok-Sagyz* and *Krim-Sagyz* and are dandelion-like plants. They are quite hardy, growing in the semi-desert regions and as far north as 60° N. In 1937 there were well over 62,000 acres under these plants in Western Siberia, Kazakhstan, Central Asia, Transcaucasia, and now in White Russia. It is interesting to recall the fact that specimens of these plants were sent to Britain to be tested by botanists at Kew Gardens

during the peak period of the Second World War. A rather more prolific rubber-bearing tree, the *Mexican Guayule*, has been introduced into Central Asia, especially the Turkmenian Republic.

Another most versatile plant came into Russia from Manchuria, this is the *soya bean*.¹ Over 250,000 acres are devoted to it in the Ukraine and the North Caucasus. This provides a flour which is rich in essential foods, especially vegetable protein, and can be used as a source of glucose. It also yields vegetable oil, a valuable raw material for the manufacture of fuel, margarine, soap and cattle cake. Besides these many uses, soya bean has a high value as pasturage, dry fodder and silage for cattle. In time of war, it has its uses in the manufacture of explosives. We remember it perhaps better as an ingredient of war-time sausages and as a substitute for "almond-paste!" (see p. 187).

A kind of giant millet called *sorghum*² has found a home in the semi-arid areas of the Southern Ukraine and Kazakhstan. This plant has been called "the camel of the vegetable kingdom" because of its drought-resisting properties. It is used as a source of sugar and animal feeding stuff (see p. 162).

Several new vegetable fibres in addition to flax and hemp are becoming increasingly important in the Soviet Union. Most of these are plants from the tropics. There is *rama*,³ which favours a subtropical climate. About 12,000 acres are now grown on the Black Sea coastal region behind Batum. Another such fibre plant grown in the valleys of the Central Asian rivers,



Fig 73 —KENDYR (*Apocynum venetum*).

This is another fibre plant now grown in Central Asia and in the valleys of the Kuban and Terek Rivers. It is also useful in the manufacture of artificial silk, parchment, alcohol and certain acids.

¹ *Glycine hispida*

² *Andropogon sorghum*

³ *Hibiscus sabdariffa*.

especially the Chu, in the lower Volga and in the Kuban, is *kendyr*.¹ As yet, *kendyr* only occupies some 70,000 acres, but it will yield about 4 per cent. of rubber. However, it is mainly grown for its fibre and made into a hard-wearing cloth. In addition, another substitute for jute has been found in Bombay-hemp, or *kenaf*.² This is now grown quite extensively in Central Asia, the Caucasus area, the Crimea and Southern Ukraine. *Kenaf* is an ideal fibre for making into sacks which are in great demand by the sugar industry.

Potatoes have long been grown for food on all medium soils. They have chiefly been important in the region between the Ukraine and the flax-growing area north of Moscow. The acreage of potatoes is increasing because they have so many industrial uses. On distillation they yield alcohol and this is used in one stage of the synthetic rubber industry (see p 239). The important regions are near Moscow, Voronezh and Kuibyshev.

Thus has science helped agriculture. Michurin has evolved new types of fruit: melons can now be grown in the Moscow region. New plants are making an appearance even in former deserts. Some of these attempts may still be experimental and make us smile, like the cross between the tomato and potato which grows tomatoes on top and potatoes in the ground—a two-in-one plant! Nevertheless, these developments are not unimportant for they show the march forward in Soviet agriculture and further demonstrate the importance of the interchange of ideas in the future. What helps the Canadian or British farmer will also help some Soviet farmer, and the converse is also true.

¹ *Apocynum venetum*

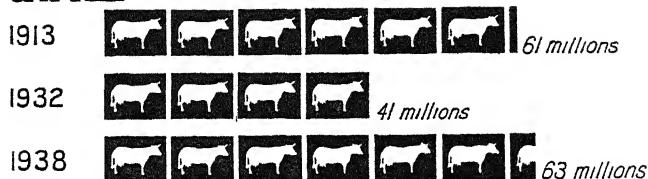
² *Hibiscus cannabinus*.



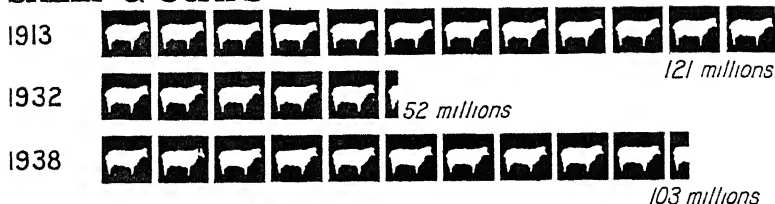
Fig. 74.—BOMBAY HEMP OR KENAF
(*Hibiscus cannabinus*).

An annual shrub which grows to a height of 8 to 10 feet. It is a peculiar plant grown mainly for its fibre which is obtained from the inner bark. This fibre does not absorb water and is made into coarse cloth and sacks. It is grown as a substitute for jute in Central Asia, Caucasia and the Southern Ukraine.

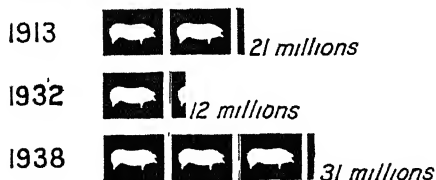
CATTLE



SHEEP & GOATS



PIGS



HORSES



Fig. 75.
LIVESTOCK IN THE
U.S.S.R.

(e) *Developments in animal husbandry*

As is all too apparent in Europe, it is in time of war that the livestock of a region suffer most. The Revolution, Civil War and Wars of Intervention witnessed a great depletion in the number of animals in Russia. Later, the situation grew even worse during the 1920's, for many cattle

were slaughtered by the "kulaks" as a form of resistance to the new collective farms.

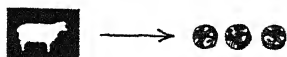
Numbers alone do not show the recent developments in their best light. Everywhere there is a close link between science and animal husbandry. Work is carried on by hundreds of scientific research institutions, in addition to the smaller laboratories which function at machine and tractor stations and on collective farms. Tremendous strides have been made in the improvement of the types of stock, which is at once apparent in the greater yields of milk and the average increase in the weights of both fleece and carcase. This is portrayed in Fig. 76

The following table shows that, in sheer numbers, the 1938 position was better than in 1913, with the exception of sheep, goats and horses. The Second World War has greatly depleted the numbers once again.

WOOL YIELD

1917

Average Annual Yield of Wool per Sheep
= 2.86 Lbs



1939

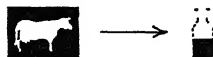
Average Annual Yield of Wool per Sheep



MILK YIELD

1917

Average Annual Yield of Milk per Cow
= .5 Ton



1939

Average Annual Yield of Milk per Cow
= 3.5 Tons



Fig 76 —IMPROVEMENTS IN THE YIELDS OF
WOOL AND MILK (1917-1939)

Table 3

Year	MILLIONS OF HEAD			
	Cattle	Sheep and goats	Pigs	Horses
1913	61	121	21	35.8
1932	41	52	12	19.6
1933	38	50	12	16.6
1934	42	52	17	15.7
1935	49	61	23	15.9
1936	57	74	31	16.6
1937	57	81	23	16.7
1938	63	103	31	17.5



Plate 30 —CATTLE GRAZING IN KAZAKHSTAN.

This Soviet Republic covering over one million square miles is one of the largest stock-raising regions of the U S S R and has no less than 10 million head of cattle. The breeds have been improved by crossing the native herds with imported strains. Notice the mountains of Central Asia rising in the background. Meat-packing is now an important industry at Sempalatinsk and Alma Ata.

As in the case of plants, native types of stock are being crossed with pedigree strains, many of which have been imported. It is in this connection that the practice of *artificial fertilisation*, or insemination, has made it possible to speed up the improvement of herds and flocks. This is so economical that one pedigree bull can be the father of thousands of calves instead of a hundred or so, e g in 1938, 1536 cows were fertilised from one bull and produced 1490 calves. A new breed of pig (Askanya) has been produced by crossing a large English-White hog with a South-Russian sow. This is a much better type of pig and, in addition, has the virtue of being suited to the Ukrainian environment. Similar work has been carried out with both cattle and sheep. Experiments have even been conducted to see the effect of fitting cows with false teeth when their own teeth are badly worn !

Great attention is now paid to the feeding of animals. In the past, natural permanent pasture was the chief source of fodder. Now animals are becoming more and more important in the regions which until recently practised arable farming to the exclusion of pastoral farming. It is in White Russia, the Ukraine, the Moscow and Kursk regions that pig-rearing



Plate 31.—A REINDEER STATE FARM

Even within the Arctic these farms have been established where scientific ideas are applied to the rearing of these animals. As a result the people have a larger measure of security and the exchange of hides and furs for wheat is arranged. Education is obtainable at certain fixed settlements.

is carried on, but the main source of food for the animals varies with the area, from potatoes to sugar-beet pulp and maize. This shows that there is an increasing tendency towards mixed farming and that the animal husbandry is fitted in to the varying crop rotations of the different agricultural regions. There has always been in Russia the difficulty of winter food for the animals, but this is being largely overcome by the production of hay and other sown grasses and by the storage of other fodder plants in silos, which are attached to most collective farms.

Not only is important and interesting scientific work being accomplished with the usual domestic animals—cattle, sheep and goats—but State farms and sanctuaries are being set up for useful fur-bearing wild animals. Hunting and trapping have been important occupations for centuries in Russia. However, much of it was but senseless plundering, with the result that the red deer, wild boar and aurochs have been exterminated. To prevent any such further development, hunting is being combined with science. Certain animals are protected; and, for others, forbidden or "closed" periods have been prescribed during which they cannot be

hunted. We have long had in Britain such "closed seasons" for game. These prohibitive measures have already managed to save the elk, and its breeding is encouraged by all possible means. Hunting is now a "collective" occupation. The hunters are educated to understand the scientific basis of animal economy, and equipment is made more efficient and more humane. Special hunting colleges have been created, and the mass breeding of sables, silver foxes, mink and martens is in progress.

Practically every region in the Soviet Union has its "sanctuary." It is not simply a kind of museum; work is done there. Attempts are made to acclimatise foreign animals, like the zebra and Tibetan yak, and it is in these sanctuaries that the crossing of wild and domestic animals takes place with a view to the improvement of the domestic animals of the U.S.S.R. As examples, the North American musk-rat which is noted for quite a valuable skin, now numbers many thousands, having increased at an unusually high rate. The nutria from Argentina at first settled quite happily in the Caucasus region but later, unfortunately perhaps for the nutria, it shed its tail every year as a result of the severe winter frosts.

THE CHIEF AGRICULTURAL REGIONS

The map (Fig 33), which shows the distribution of natural vegetation, provides a key to the distribution of the chief agricultural regions. The former mixed forests and moister steppe-lands are now the major regions of crop farming. The coniferous forest region has expanding "islands" of tilled lands and a few pastures. In the tundra the "islands" of tilled land are still very small indeed, but they are growing and there is quite considerable pasture for the hardy herds of reindeer. It is on the drier steppe that the traditional pastoral farming is still practised; whilst the deserts now provide important crops in the irrigated oases.

✓ 1. *Polar Agriculture of the Tundra Region*

The Northern Tundra has from very early times been the home of small groups of people who managed to win a most difficult livelihood by hunting, fishing and keeping herds of reindeer. The reindeer is an all-provider for these nomadic peoples. When alive, it provides them with milk and pulls sledges; and when killed, its skin is used for clothing of every type, acts as a tent cover or is stretched over a wooden framework to make a light canoe. Reindeer meat is the basis of food for the northern peoples, and bones are made into needles and other useful articles as well as being carved into charming statuettes.

There has always been the seasonal migration of these northern peoples. In winter they move southwards into the edge of the coniferous forest. Here there is some measure of shelter and a little more food in the dwarf



Plate 32.—RAISING VEGETABLES ON OPEN GROUND WITHIN THE
ARCTIC CIRCLE.

All the new ports and settlements within this northern zone now grow their own fresh vegetables and keep a few farm animals. This picture shows such crops as cabbages and potatoes at Tixie Bay, a port at the mouth of the Lena River which serves navigation along the Lena and on the Northern Sea Route

bushes nosed out by the sensitive reindeer. In summer, when the snows are melting and temperatures rise, the herds travel northwards to feed on the mosses and lichens of the tundra. They also leave the forests to avoid the swarms of mosquitoes which haunt the wide expanses of swamp and lake during the early summer thaw and become a real pest to both man and beast.

Prior to the work done for these northern peoples by the Soviet Government, they were all declining in numbers. They were ignorant, illiterate and suffered great hardship as the result of their difficult surroundings. There are now about twenty-six of these minor nationalities with languages of their own. The chief groups are the Yakuts, Evyenki, Komi and the Nyentsi (see Chapter V). Now attempts are being made to put reindeer-keeping on a scientific basis. In the past, certain grazing-grounds were overstocked and many of the deer died in winter. This haphazard movement of peoples and herds is now controlled and supplementary food is



Fig. 77 — RYE (*Secale cereale*)

This is the staple cereal of the forest zone and is a harder plant than wheat and can be planted in the autumn except where the winters are exceptionally severe. In the field it resembles bearded wheat or barley. Now more and more wheat is being grown and the white loaf is replacing the black rye bread.

At the mouth of the Yenisei they grow fields of cabbage and potatoes almost in latitude 70° N. In 1944 the Norilsk farms planted 350 acres, including potatoes, cabbage, beet, lettuce, radishes and tobacco.

Despite the growing season being less than ninety days some grains and roots can now be grown above a frozen subsoil. Barley, oats, and spring wheat are sown after being "vernalised". Wheat with such a high yield as 16 cwt to the acre was grown in Archangel province for the first time in 1937. Cattle, pigs, rabbits and hens are kept and there is a supply of fresh vegetables. Hot-houses are used to grow lettuce, cucumbers and tomatoes; and both these and the animal sheds are heated and lit with electricity. Hens are encouraged to lay, and cows to yield milk, by lighting their sheds. Less hardy plants are even grown

grown. In this way, many long journeys are avoided from the winter to the summer pastures. It is impossible for these people, especially the men-folk, to be entirely sedentary but they do find time to spend several months in settlements where they receive education, medical treatment and relaxation at the cinema, or with radio and gramophone. When on the move some of these new aids to a happier life travel with them and are established at certain centres. They are called "culture bases".

In recent years industry has come to the Tundra, and thousands of people who are engaged in mines, quarries or ports in this region have now to be provided with food. Kirovsk (40,000), Igarka (20,000) and Murmansk (117,000) are all within the Arctic Circle. These and many other settlements now grow fodder crops in the river valleys and store hay for the winter. At Tixie Bay, at the mouth of the Lena, at Norilsk, and Dudinka at the

World RYE (46 mill tons)

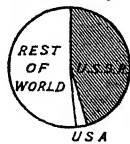
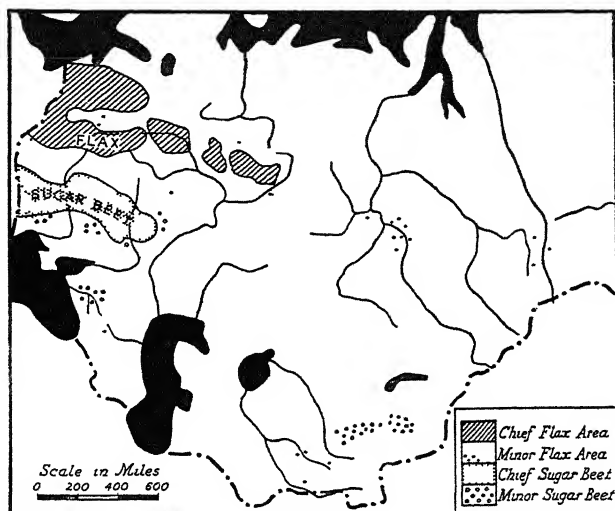


Fig. 78.

THE PRODUCTION OF RYE (1935-36).

in electrically heated soil. Electrodes are stuck in the ground round the roots. This all may sound elaborate but to deliver fresh vegetables and milk, with their precious vitamin content, from the southern regions would be impracticable. Now each settlement has its state and collective farms to supply potatoes or milk, carrots or meat. It must not be thought that

Fig 79.
THE REGIONS
GROWING FLAX
AND SUGAR-BEET
IN THE U.S.S.R.



the Tundra is a major agricultural region. The density of population is still very small and the area is large, but thousands can now live a full and cultured life even though the environment is harsh and austere.

2. *The Clearings in the Coniferous Forest*

As in the Tundra the clearings in the forests simply help to satisfy the local needs for agricultural products. No attempt is made to produce a surplus, for this would be most difficult on account of both climate and the tendency to poor soils

The amount of land which is under agriculture is only about 30 per cent of the total. Millions of acres still remain as virgin forest, composed of pines, larch and fir, mixed with the deciduous birch. Nevertheless, in the western forests of the Leningrad and Karelian regions agriculture has developed. The growing season is quite short and, although the winters are less severe than in the Siberian forest-lands, they tend to be sunless and damp. The soils are typical of the whole region and are mainly sandy podsols. The cereals grown are oats, winter rye, barley and special varieties of spring wheat. Potatoes and all kinds of vegetables are becoming

increasingly important, and the river meadows and sown pastures supply food for dairy herds. Of course the cattle are stall-fed during the winter

On either side of the Urals, where the valleys of the Dvina, Pechora and Ob cross the forest, cattle are reared and hay is cut for winter feed. There are small crops of oats, barley and rye and often these cereals are used for fodder and not for grain. Flax is also quite important, as for example, near Vologda.

It should be pointed out that hunting and trapping, fishing and lumbering are far more important occupations in this region than agriculture. Nevertheless, agriculture is a necessary part of life, even here.

3 *The Rye-Flax-Dairying Region of the Mixed Forest Belt*

We have already seen how this triangular shaped mixed-forest region became the home of the Russians. It was in the clearings of this "backwoods" region that they grew their food (rye) and their clothing material (flax). There was honey to be gathered from the wild bees, and protection to be found in the woods from the enemy of the grassy plains to the south. This area wedges out eastwards as the climate becomes drier and more continental. With increasing drought towards the south, the trees become fewer and the wooded steppe passes into the steppe proper, which is now the grainland of the Ukraine.

The mark of peasant agriculture still remains, in that rye is the chief cereal. Formerly, it was a case of rye being grown on peasant strips, but now rye is grown on State and collective farms. As can be seen in Fig. 78, the Soviet Union grows almost half of the world's production of rye. A damp climate is suitable and rye is sufficiently hardy to be the chief winter crop. Gradually, black rye-bread is being replaced by white wheat-bread, and some of the wheat is now grown in this region. As would be expected, the other grain grown alongside rye is oats. This ripens in the damper and cloudier climates of the north, just as in Britain.

Of the industrial or technical crops flax is by far the most important. This can grow under damp conditions and on quite poor soils. Flax takes up a large proportion of the cultivated land to the west and south-west of Moscow, being especially important near Kalinin and Smolensk. Flax is grown mainly for its fibre, and is naturally the basis of the linen industry.

Flax is an exhaustive crop for the soil; now clover and cultivated grasses are sown in rotation, for these along with animal dung return nitrogenous compounds to the soil. This temporary pasture-land, together with water-meadows and the wetter cleared areas, supply fodder for an important dairy-farming region. Dairying is concentrated near the main centres of population of the Moscow region and stretches west and south-westwards into White Russia. Thus the towns are supplied with their milk and butter; as would be anticipated milk is the more important of the two products.

It is in this region, near Yaroslavl, that quite a famous State farm,¹ noted for the rearing of a pedigree dairy herd, is situated. In 1937 this farm held the Soviet farm record for milk yield; the average from over 250 cows was about $3\frac{1}{2}$ gallons each per day.

The rearing of pigs is also becoming increasingly important. They fit quite nicely into the farm routine of the area; considerable food being available in the form of potatoes, skimmed milk and the by-products of the milling industry.

Potatoes form one of the staple foods of the Russians and they are quite extensively grown in this non-Black Earth area. Even to-day, potatoes and

1935-36

World WHEAT (128 mill tons) World BARLEY (43 mill tons) World OATS (67 mill tons)



Fig. 80

THE PRODUCTION OF
WHEAT.



Fig. 81

THE PRODUCTION OF
BARLEY.



Fig. 82.

THE PRODUCTION OF
OATS.

rye bread, with its quite salty flavour, form the basis of the people's diet. To these are added cabbage soup, often with beet-root and a little meat or salted herring. These form the mainstays, but since 1939 more and more tinned meat foods and fruits have been available.

Potatoes are, therefore, food for man and for animals and now they are finding an important place among the industrial and technical crops. Potatoes can be distilled to yield alcohol which is used at one stage in the production of synthetic rubber and allied materials. As a result, the acreage has more than doubled since 1913, increasing from less than 8 million acres to 18 million acres in 1937.

Potatoes require a fair amount of moisture during their growing season and it has been found that the early-sown varieties do not thrive in the drier regions of the Southern Ukraine and Lower Volga. This is obviated in some degree by planting the potatoes later.

The aim in all large regions of the U.S.S.R. is to be self-sufficient in potatoes, and transport over long distances is prohibited. This has led to an extension to the east, in the Urals area. With the same end in view, the Far North grew 80,000 tons in 1935.

The U.S.S.R. leads the world in the production of rye, flax, wheat, barley, oats and sugar-beet (see Figs. 78, 80, 81, 82). As we have seen the two former crops are the major crops in this region, whilst the remaining four are found in the next region to the south.

¹ Karavayev State Farm near Kostroma

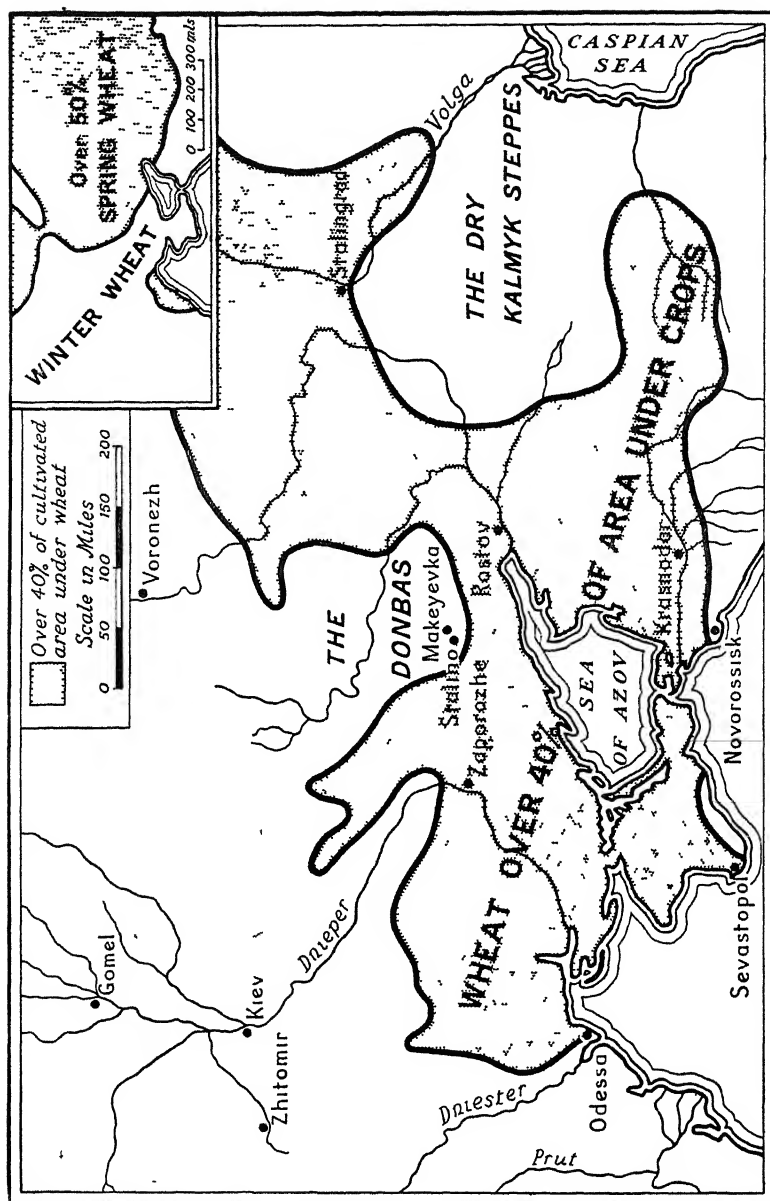


Fig. 83 — THE WHEATLANDS OF THE UKRAINE

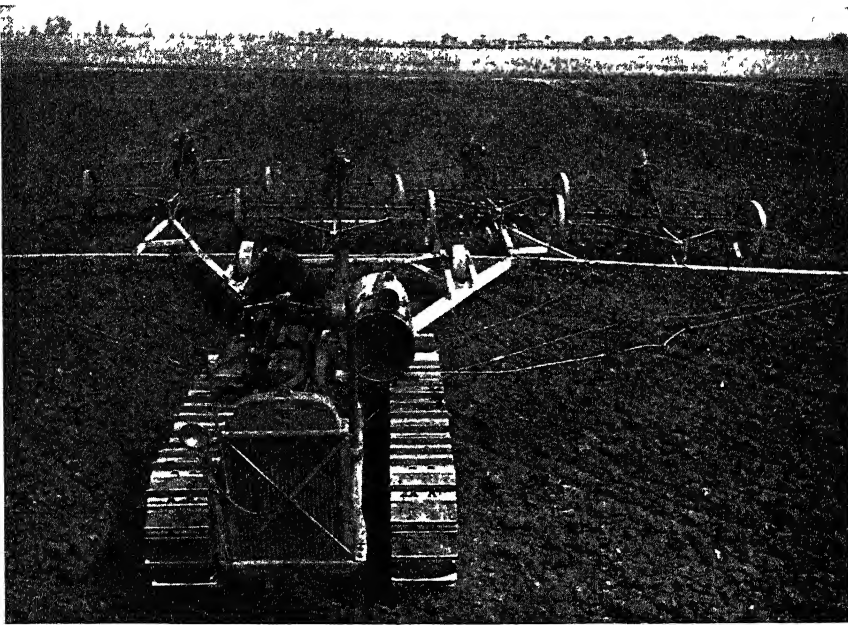


Plate 33.—MECHANISED FARMING IN THE UKRAINE

This photograph shows how the farm operations are speeded up by the use of tractors. Five men are able to do the work of over a score of farm labourers. Apart from its being more speedy it is more efficient, tills more deeply and saves labour. This is the Budyonny Collective Farm—named after the Soviet general

4. *The Grain Lands of the Black Earth Steppe-land*

This region (see Fig. 83) lies between the forested region to the north and the drier grasslands of the Aral-Caspian region. The natural grasslands, or steppes, were occupied by the pioneering and “land-hungry” Russians in the nineteenth century, as were the prairies of America’s Middle West. The fertility of the steppes became proverbial because of the Black Earth, and they were destined to become the granary of both Russia and Europe. Prior to the Five Year Plans, the main grainlands were in the Ukraine, but between 1928 and 1934 over 32 million acres of virgin land were added in the Middle and Lower Volga regions and in the western steppe of Siberia.

Although wheat is being grown on an increased scale in the non-Black Earth areas (see Fig. 64), the former steppe-land still produces most *wheat*. This is grown on both collective and State farms by extensive and machine methods. West of the Don the growing season is longer, and the snow cover is thicker, which allows winter wheat to be grown especially in the



Plate 34—THE VIRGIN STEPPES OF KAZAKHSTAN

Large tracts in the "Middle West" of the U.S.S.R. are as yet undeveloped. The monotony of the unbroken plain is broken in the picture by a slight escarpment in the distance and prehistoric monuments in the foreground which date back to about 1000 B.C. They may belong to the Kara Suk stage of the Siberian Bronze Age.

Ukraine, and it is even extending into the North Caucasus, the Crimea and into Central Asia. The effect of thicker snow-cover, or milder winters, is to prevent the soil from "heaving" and "lifting." Just as bushes and plants are lifted out of the ground in Britain by keen frosts so are the young wheat shoots. If this took place the roots would be exposed and dried by the wind. This heaving does occur in the Volga region and the wheatlands of Western Siberia, so there spring varieties are chosen. Now there is almost twice the acreage under spring wheat,¹ but the tendency is for regions to grow winter wheat where it is at all possible. For one thing, the yield of winter wheat is greater.

We have already noticed that these grainlands of the south are ceasing to be single-crop regions. Continual cropping tends to encourage soil erosion, for impoverished soil has a dusty texture. The fields under arable crops are bare for the greater part of the year, and so the wind can blow away the fertile topsoil; or else occasional storms can form gullies which wash away all the soil within their reach. Now a system of crop-rotation is

¹ In 1937 spring wheat=69.6 million acres, winter wheat=36.7 million acres.



Fig. 84.—MAIZE
(*Zea mays*).

This is a coarse, quick-growing annual which requires a subtropical climate. It is grown in the Southern Ukraine and the Caucasus region mainly as a fodder crop, but it has many other uses (flour, starch, sugar, explosives).



Fig. 85.—MILLET
(*Panicum effusium*).

This, and many other closely related plants are grown for fodder in the drier parts of the Ukraine, the Volga lands and in Kazakhstan. It often replaces wheat but is less hardy although it can be grown in regions of lower rainfall.

practised. This usually covers six years' crops and clover is left for at least two of these years. Clover binds the soil grains together and so improves the physical state of the soil. Another aid is to plant small woods or "shelter-belts". These protect the farms, slow down the wind and therefore reduce evaporation, as well as helping to keep the snow on the ground. It is a serious matter if the snow is blown off the fields. The supply of moisture from snow-melt, and the spring and early summer rains, are most important. It is during this early part of the summer that plants are growing at their maximum rate and need most moisture.

Between 1913 and 1937 the area under *sugar-beet* increased two-fold. This is a technical crop since it is the source of sugar. Previously most sugar-beet was grown in the Ukraine. Now it is spreading into the Georgian Republic of the Caucasus, into Central Asia (Kazakhstan and Kirghizia) and even into the Ussuri and Amur valleys of the Far East. The loss of the Ukraine during the Second World War accelerated this development. Over a million acres have been given over to sugar-beet east of the Urals.



Fig. 86 —HEMP
(*Cannabis sativa*).

This is an annual with erect stems, greenish flowers and it is a native of Central Asia. Grown for its white, silky fibre, it can be made into ropes, canvas, carpet warp and sailcloth. The seeds yield oil used in the manufacture of paint and varnish. A drug called *ganya* can also be obtained from hemp.



Fig. 87.—COTTON
(*Gossypium hirsutum*).

Cotton has long been grown on irrigated land in Central Asia. Both the yield and acreage have increased over three-fold since 1913. Because of its extensive plantations of cotton, Uzbekistan is known as the "Land of White Gold." Cotton is now grown in Caucasia and non-irrigated types in the Southern Ukraine.

during recent years Sugar-beet is planted after a grain crop on land which is near good communication lines, either railways or good roads. Thus the refineries are placed at focal points in the network of communications. Although new areas are growing sugar-beet, the Ukraine, near Kiev and Kharkov, still accounts for about 65 per cent. of the production and most large centres have refineries (see Fig. 79).

Around the shores of the Black Sea and the drier lands north of the Caucasus *barley* is quite an important crop. This grain is a most hardy plant, growing on the dry southern margins as well as on the cold, northern margins of the arable belt (Fig. 66).

Rye, oats and potatoes are not very important, they decrease in importance southwards. However, some are grown; but other more important crops are *maize*, especially in Bessarabia and the South Ukraine,



Plate 35 —TURKMENIANS HARVESTING THE COTTON CROP.

The republic of Turkmenia, which includes large areas of desert, is rapidly becoming important for the production of cotton on irrigated land. The crop has increased five times since 1914. The Turkmenians are tall with brown skins, narrow heads and straight, high, prominent noses.

millet which occupies quite an appreciable area in the Lower Volga and the Upper Don, and *buckwheat* and *hemp* which are grown north and north-east of Kiev.

Two more industrial crops must be mentioned : *cotton* and *sunflower*—one a fibre, and the other a source of vegetable oil which is used for the margarine, soap and kindred industries. Other oil-bearing plants like peanut and soya bean are being developed. It must be remembered that all the cotton before the Revolution came from irrigated land in Central Asia. However, in 1930 it was found that cotton would grow quite well in the Southern Ukraine and in non-flooded fields. The area under cotton in the Lower Dnieper and Northern Crimea region covered 576,000 acres in 1937.

As can be imagined, most farms have some livestock which are fed on the temporary pasture land, or on farm waste like bran and sugar-beet pulp. Thus there are quite a number of cattle, sheep and goats. Horses are kept for farm work, but a considerable amount of the sowing and reaping processes are mechanised. This is well brought out by the fact

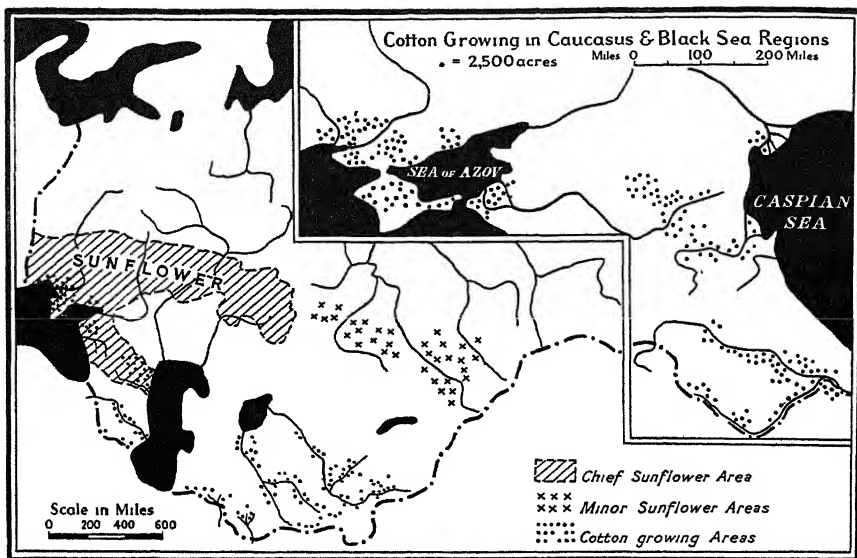


Fig 88.—THE REGIONS PRODUCING COTTON AND SUNFLOWER.

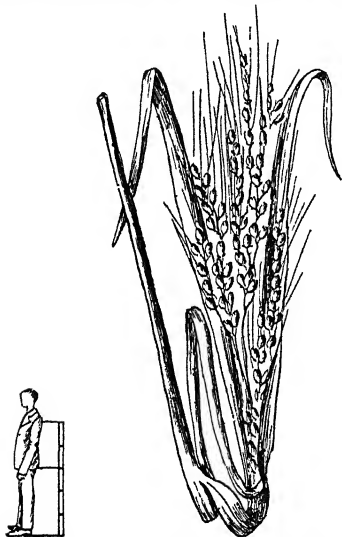


Fig. 89.—RICE (*Oryza sativa*)

The principal cereal crop in the irrigated lands of Central Asia and Transcaucasia. In recent years the cultivation of rice has been extended to the Northern Caucasus, the Southern Ukraine and near Kharbarovsk in the Far East, which is its native region.

that in 1933 70 per cent. of farm work was done by horses but this had dropped to 34 per cent in 1937. The extensive grain-lands are ideal for combine-harvesters and cultivators, and between 1933 and 1937 these had increased from 10,000 to 105,000.

Near the large centres of population most of the cattle are used for milk production and another feature is the occurrence of market-gardening.

5. The "Fertile Crescent" of Subtropical Crops

Of all the subtropical plants *cotton* is the most important. It is a specialised crop largely dependent on irrigation. Central Asia is the main irrigated area and really consists of a great number of separate oases surrounded by the great deserts of Kara Kum and Kizil Kum. The other important irrigated area is to be found in the Caucasus region. Together these two areas have over 13½ million acres of irrigated land. To-day the two main methods of irrigation use either

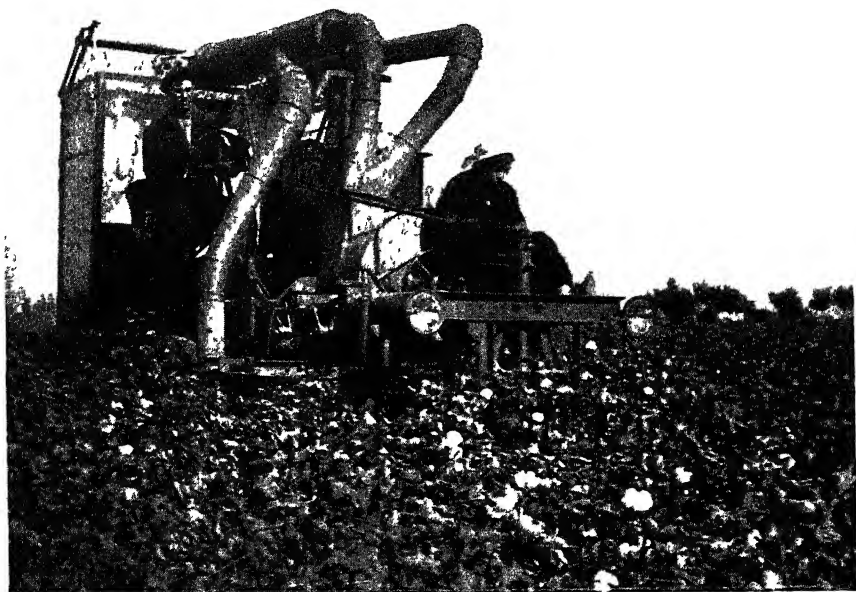


Plate 36 —COTTON-PICKING MACHINE.

It has not been easy to produce a mechanical cotton picker for the reason that the cotton bolls are not all ready at the same time. This weird-looking apparatus is a kind of elaborate vacuum cleaner which sucks the cotton lint into the container at the back. Notice the headlamps for working after dark when it is necessary to complete the picking.

the canal or the pump. Canals are used when the rivers are not very deeply trenched or when the water is ponded back above a dam. Pumps are of course necessary where the river water is below the level of the fields, as along the River Kura which flows into the Caspian south of Baku.

Canals are the main method used in Central Asia, where a complicated network of ditches is found along the Amu-Darya. One canal, the Shabat, is over a hundred miles long and is sufficiently deep to take quite large boats. This system alone irrigates five million acres, that is about one-seventh of the area of England, but of course not all of this is under cotton. The two main types of cotton grown are the American Upland and the Egyptian. The latter variety has a good length of fibre, more correctly termed the *staple*. The cotton with the longest staple is Sea Island cotton (about $2\frac{1}{4}$ inches), and this variety was first introduced into the Shirabad district of Uzbekistan and Azerbaijan in 1936. American Upland has a $1\frac{1}{2}$ -inch

staple and Egyptian $1\frac{3}{4}$ -inch The yields from Egyptian cotton have reached 12 cwts per acre in many districts of Turkmenia.

Uzbekistan is the chief cotton-growing republic, accounting for more than half the total crop. The Russian republic comes next in importance, and comprises the new area near the Black Sea coast. The next important region to notice is the Caucasus; especially in the Azerbaijan republic along the Kura valley Cotton is grown along the other river valleys which

drain the neck of land lying between the Caspian and Black Seas. In addition to the Kura there are the Araxes, Terek, Kuma and Kuban rivers (see Fig. 88).

Recently, Maximenko and other Soviet scientists have evolved a type of cotton which grows coloured cotton-lint. This has already passed the experimental stage and of course will make dyeing unnecessary. In 1944 about 350 tons were grown and quite fadeless colours in green, rose, lemon and brown are possible.

The geographical requirements of almost any subtropical plant are to be found in this south-west region of the U.S.S.R. Man's chief work has been to bring the water to the fertile but parched land. The summer temperatures soar to over 70° F. and the winters are close to freezing-point. Nevertheless, the winters are short and there are about 200 days without any frost in this cotton-growing belt.

In the past cotton growing always required much labour for the picking of the cotton head or "boll." Not only has each boll to be picked, but there is a tendency for the bottom ones to be ready before those on the top of the cotton bush. This has

delayed the introduction of cotton-picking machines but the difficulties are being overcome and machines like big vacuum cleaners pass down the rows

As in the cotton belt of U S A., pests like the boll weevil attack the plants. Here again science comes to the aid of agriculture, and low-flying aircraft skim over the fields and spray the pests with arsenic compounds in liquid or powder form Aircraft also combat the locusts which are often a great nuisance in this region.

In the cotton region special plants, like *lucerne*,¹ are grown in rotation

¹ Also known as alfalfa.



Fig 90.—TEA (*Camellia thea*).

This subtropical plant has recently been introduced into the Soviet Union. It requires an abundant rainfall and is grown on the deep, well-drained soils of Transcaucasia, chiefly in Georgia and Azerbaijan.



Plate 37.—TEA PICKERS ON THE CHAKVA STATE FARM, ADJARIA.

The Soviet Union now produces enough tea for home requirements and this mainly comes from the Western Caucasus in the Republic of Georgia. These bushes have been well cut back. Notice the large sun-hats worn by the pickers which shows that the sun must be very powerful in this area.

This is a most important fodder crop and helps to revitalise the soil. More and more *rice* is being grown in the Soviet Union. The variety grown is the one requiring irrigation and is restricted to the Caucasus and Central Asia, as well as the Far East, north of Vladivostok. The yields of rice are usually high, and in 1937 the high figure of almost 2 tons per acre was obtained in Krasnodar, on the north-east Black Sea region.

Another subtropical plant, *tea*, was introduced into Georgia as far back as 1892, but little progress was made and the quality was poor. By 1939 the tea plantations covered over 100,000 acres. These are mainly in the Caucasus region, in the republics of Georgia and Azerbaijan. Like other plants, tea is now being grown farther north. There are over 1000 acres in the Krasnodar territory of the Black Sea coast. In the Kuban tea bushes have been known to withstand six severe winters with quite keen frosts. The leaves of tea have to be dried and packed on the spot and therefore factories have been built using machinery similar to that in the best tea-blending stations in India and Ceylon. The tea plant is able to withstand a little frost in winter, but, like cotton, it requires moisture during the

summer. This must not, however, remain round the roots. Consequently tea is grown on well-drained slopes.

The dry subtropics of Central Asia are becoming a kind of "Soviet California" for pomegranates, olives, figs and almonds are now being grown. But it is in the more humid subtropics of the Caucasus and Black Sea coast that the main orchards of *citrus fruits* are found. Now thousands

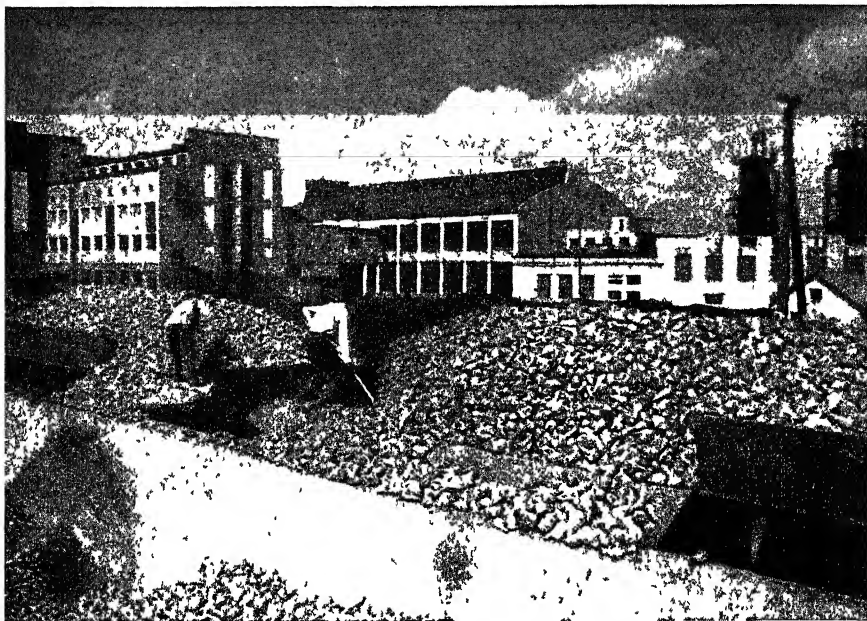


Plate 38.—SUGAR-BEET REFINERY, KIRGHIZ S.S.R.

The U.S.S.R. is dependent on sugar-beet for its sugar supplies and now occupies first place in the world for production. From the Ukraine near Kursk and Kiev it has spread to the Volga, Western Siberia, the Far East and Central Asia. Factories have been built in all these areas, and the picture shows the Kalinin Refinery, Kirghiz S.S.R.

of acres are planted with oranges (tangerines), grape-fruit and lemons. In 1935 Georgia alone grew over 200 million tangerines and in 1937 had over 15,000 acres under citrus fruits. It is the subregion of Adjara that is most important in Georgia for citrus orchards and vineyards. Tobacco is also grown there.

A similar type of agriculture is found along the "Riviera" coast of the Crimea with its more typically Mediterranean type of climate. The southern aspect favours the tobacco plantations and vineyards which are interspersed amid the lovely resorts like Yalta. The most famous orchards

and vineyards of this locality are those of Massandra. The Crimean coast is a delightful spot which looks so peaceful with its luxuriant flowering plants such as magnolia and azalea. Near Sudak there is a farm specialising in rose-growing with special apparatus for distilling the petals into rose oil. This farm is called the "Valley of Roses."

In the oases of Central Asia cotton and lucerne take up a large amount of the land, but sugar-beet and tobacco cannot be ignored. For both these crops factories are being built. In 1945 Uzbekistan had four sugar-beet factories which were capable of handling from 1000 to 2000 tons in 24 hours. Others are also being built in Kirghizia and the Kazakh Republic. Sugar-beet does well in irrigated arid lands because the continuous sunshine increases the sugar-content of the roots.

Several centres have been established in Central Asia for experiments in subtropical agriculture. A new tuber like a potato, only much larger, is being grown. It is called *Batat*, and in 1945 covered an area of 7500 acres. Even sugar-cane and jute are meeting with good results, in addition to some resin or rubber-bearing plants. One of these is the *Guaiacum* from Mexico. It is this tree which produces the very hard wood called "lignum vitae." We have noted (p. 40) that the winters can be most cold. This, of course, is a difficulty for most subtropical plants. To obviate this, lemons are planted in trenches six feet deep, over which cold-frames are placed in winter. Even in such a region where 25° of frost is common, the lemon trees have produced fruit after two years. It must be remembered that lemon is more tender than other citrus fruits.

Similarly, experiments on a large scale are being carried out in the Caucasus region of Georgia. In the drained lowland area of the Kolchis (Colchis) (see p. 161) millions of eucalyptus saplings have been planted. *Camphor* is also grown, as well as another Chinese tree, the *Tung*. This yields an oil, which is obtained from the fruits, and forms the base of most

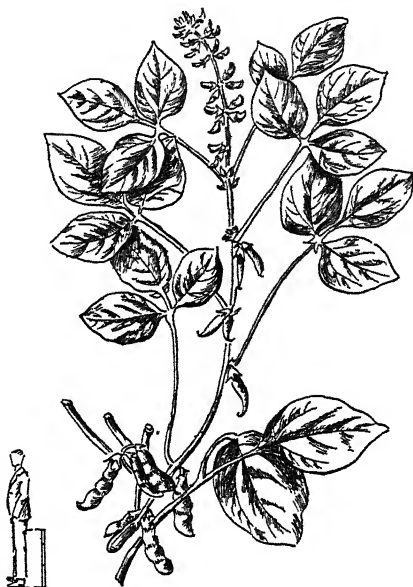


Fig. 91.—SOYA BEAN (*Glycine hispida*).

An annual, a native of China and Japan, which is largely grown in the Soviet Far East. It has short, hairy pods containing 3 or 4 seeds. These have many uses for the protein content is very high (35%). It is used for flour, fodder and the manufacture of soap and margarine.

good varnishes. The oil is obtained from small reddish fruits. Finally, it is in this self-same region that *mulberries* are grown, which are the food for silkworms and form the basis of the real-silk industry.

These experiments have been mentioned in some detail because many of these plants are slowly passing into the category of plants which are economically important. For example, in 1939 the Tung plantations of Georgia produced 3000 tons of tung-oil, which largely cut down the imports of this commodity.

6. *The Agricultural Lands of the Far East*

The term Soviet Far East, usually means the whole of south-eastern Siberia with the exception of the republics of Buryat-Mongolia and Yakutia. Here we shall give the term its widest meaning and include the Upper Yenisei and Angara valleys, the Lena basin and the Amur and Ussuri valleys. This Soviet Far East is that part of the U.S.S.R. which, along the River Amur, borders Manchurian territory held by Japan from 1931 to 1945.

It faces the Japanese islands and the Pacific Ocean. As a result of this position the economic development has been quite consciously directed to provide a food and industrial base for the Soviet armies on this "Far Eastern Front". In 1939 there were $4\frac{1}{2}$ million people living to the north and east of Lake Baikal, and of these about 4 millions lived along the Trans-Siberian Railway or along the banks of the Amur. This southern borderland has the most favourable climate in the Far East and so most agriculture is found here. It must not be imagined that the climate is anything but harsh. The "cold pole" is not far distant at Verkhoyansk; and Kharbarovsk at the confluence of the Amur and Ussuri has a January average temperature of six degrees below zero Fahrenheit (-6° F.). Attempts are being made to make this Far Eastern region completely self-sufficient for food. This will ease transport difficulties, for although the Amur system has over 3000 miles of navigable waterway, it is frozen half the year. This means a great strain would be placed on the quite vulnerable trunk railway line (T.S.R.).

Agriculture is now thriving, and between 1904 and 1937 the cultivated area has jumped from $\frac{3}{4}$ million acres to 3 million acres. Practically every collective farm is served by a machine tractor station and the Amur region alone had over 2000 combine-harvesters in 1938. This is absolutely essential, for the great need of this area is for more and more pioneer settlers.

(a) *The Amur-Ussuri Lowlands*

These lowlands are quite fertile and even now there are quite extensive forests of cedars and broad-leaf trees, including oak and stone birch. There is a luxuriance of grass and forest growth which is the result of the semi-monsoon type of climate. Although winters are cold with much frost, the summers are quite hot and this is the period when most rain falls. Even



Plate 39 —SHEEP PASTURES IN KAZAKHSTAN.

The drier natural grasslands of Kazakhstan are now important sheep-rearing areas. Notice the scrub-like grassland and the scarp in the background.

to-day, the fierce Ussuri tiger is found in these wild forest-lands, which gives some indication of the undeveloped nature of this region.

Prior to the Revolution, most of the arable land was devoted to wheat and oats. Now, here as elsewhere, the tendency is for agriculture to be more varied. Vegetables, potatoes, sugar-beet and tobacco, to mention but a few crops, are grown. Wheat remains the principal crop and is sown on large farms of an average area of over 10,000 acres. Oats are next in importance. Sugar-beet has been introduced into the region north of Vladivostok and a new refinery has been built at the near-by town of Voroshilov. The important plant, the soya bean, has been introduced here as well as in the Ukraine (see p. 164). There were over 150,000 acres in 1942, and one State farm concentrated on soya and grew 15,000 acres. This farm is named after the former leader of China—Sun Yat-Sen. Many of the new pioneers are Russians, but the native Koreans grow crops like rice and a kind of millet called *kaoliang*.

Attempts are being made to increase the number of livestock on the farms. The number of pigs in this region was 300,000 in 1938. Similar increases are found in the number of cattle, poultry and sheep. Cattle are reared for meat and for milk especially near the larger urban centres.

(b) *The Stock-lands of Buryat-Mongolia*

The region around Lake Baikal is called the republic of Buryat-Mongolia and although over three-quarters of the area is covered by thick forests it is one of the major cattle-breeding regions of Soviet Asia. There are among the ridges and plateaux quite extensive areas of steppe-land. Previously they were the home of large numbers of nomadic Buryats and Mongols but now the tendency is for more and more herds to be organised into collective stock-raising farms. In 1938 there were 400,000 head of cattle, and just over that number of sheep and horses. The Buryats, who were formerly a declining group, illiterate and much superstitious, are now adopting a more settled life.

Small villages have been built of wooden board houses with yards quite neatly fenced in and fronting a wide street. Sewing machines and electric light are found in a number of homes and the village has its school, restaurant and village club. Farm buildings too, are being built, and this, together with the collection of hay, has largely helped to reduce the death-rate among the livestock. The winters are most severe.

Stock-rearing is not the only occupation for there was, even in 1938, almost a million acres under crops. The chief grains are wheat and oats; with hay, rye and a little flax as crops of lesser importance.

There are a whole series of minor basins of lowland steppe at the foot of the great mountain ranges which form the southern frontier. East of Lake Baikal they are seen near the towns of Chita and Nerchinsk, along the tributary of the Amur called the Shilka. To the west, similar tracts of tilled land, surrounded by mountain and forest, are found near Krasnoyarsk on the Upper Yenisei, with the Minussinsk basin farther upstream. Farther west these areas become more extensive till they link up with the main arable belt which stretches from Western Siberia across the Volga to the Ukraine. Wheat is now the main cereal and sugar-beet is occupying a greater acreage each year. The other notable feature is that cattle are reared for butter production as well as meat.

(c) *Agriculture in Yakutia*

We have already noticed (p. 84) that since the fourteenth century the Middle Lena area, near Yakutsk, and where the Rivers Vilyui and Aldan join the Lena, has been occupied by Yakuts. These people speak Turkic dialects and they are cattle breeders. It is said that they were driven from the rich grasslands near the Aral and Caspian Seas by the Mongols under Genghis Khan. Therefore, the Yakuts seem to have retained their traditional mode of life and have carried on cattle-rearing and agriculture for many centuries on patches of steppe-land, surrounded by the Coniferous Forest. Now hundreds of tractors and combines are available, and in 1938 a quarter of a million acres were under cultivation. This is in the neighbourhood of 60° N. Furthermore, this agriculture is practised where

the soil is permanently frozen a little below the surface (p. 62). By the use of special varieties of grain thousands of acres of wheat, rye, barley and oats can be harvested. Vegetables are not neglected, and potatoes, cabbage, onions and carrots are grown even in the Verkhoyansk region where it is considered quite warm in winter when temperatures reach 45° F. In the past the greater number of the cattle were killed before winter, for there was a great shortage of fodder. Now hay crops are kept in store, and the number of cattle had reached about 400,000 in 1938. Pigs and large numbers of horses are reared, and the Yakuts have spread northwards with their cattle into the upper valleys of the Yana, Indigirka and Kolyma rivers. These flow into the Arctic east of the Lena delta.

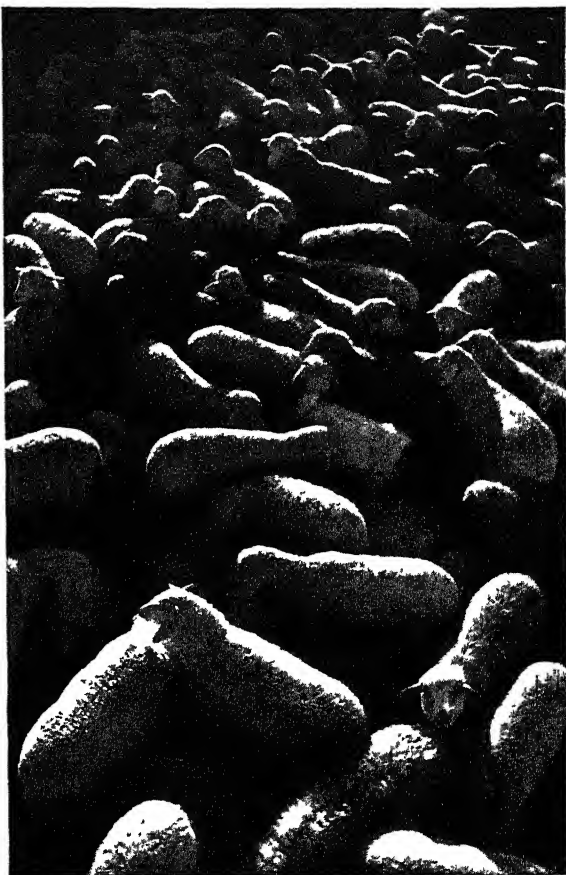


Plate 40 —A FLOCK OF KARAKUL SHEEP.

This type of sheep produces the curly type of fur, called astrakhan or Persian lamb, with the tight flat curls. The best, and the one commanding a high price, is obtained when the lambs are born dead or prematurely.

7. The Pastoral Lands of the Drier Steppes

Large areas of dry steppe still remains in the Aral-Caspian region. It is from here that Kirghiz and Kazakh pastoralists have wandered over thousands of miles in search of new pastures, just like the accounts in the Old Testament. These pastures are found chiefly in the Kazakh and Uzbek republics, where pastoral farming is the rule. In these two regions alone



Plate 41.—THE RETURN OF EVACUATED CATTLE

Thousands of farm animals were slaughtered as a direct result of the Second World War. Some cattle and sheep were able to be evacuated and here those belonging to the Paris Commune Collective Farms near Smolensk are seen returning after the area had been freed by the Red Army.

there were about ten million sheep and goats, and four and a half million head of cattle in 1938.¹ The breeds of sheep are now much improved and the merino breed is very numerous in the smaller republic of Kirghizia. This area is well known for horse-breeding; the local types are of old Mongolian stock but they are now mixed with strains from Britain and from the region of the Don Cossacks. Large flocks of the Karakul sheep are reared. It is from these sheep that the charming fur called "Persian lamb" is obtained, most proudly worn by the Cossacks on their lapels, cuffs and hats.

As with the reindeer breeders of the Arctic, much work is being done to encourage more and more nomads to be organised into "collectives." By so doing, their life can be made less precarious; they can receive scientific advice on animal husbandry, and they can also be educated and have all the advantages of social and health services. The pastures are

¹ In 1944 the United Kingdom had 9 5 million cattle, and 20 3 million sheep

being improved by sown grasses, and lucerne is now widely grown for fodder, thereby safeguarding winter food for the animals. In 1937 a little over one-tenth of all the cattle in Uzbekistan were kept on collective stock-rearing farms. This proportion has most certainly increased since that date.

8. *The Impact of the Second World War on Agriculture*

The main effect of the Second World War on agriculture was two-fold. In the first instance, by the end of 1942 an area over six times the size of the British Isles had been overrun by the Nazis. This resulted in the destruction of whole villages, farms and any implements left behind. Secondly, since any army "marches on its stomach" and the civilians had to be fed on food obtained from a smaller area, production had to be increased in the rear.

The devastation caused by the "scorched earth" policy of the Russians and the planned vandalism of the Nazis can perhaps be imagined. However, the reconstruction is more interesting. Shell-holes have had to be filled in, mines removed and then seed and implements found. Some of the seed had been hidden, or divided out, among the people of the village to be ready for the return. In some cases, the old ploughs drawn by oxen had to help the spade, for the tractors and combines had been removed or broken. This will, of course, soon be rectified. Just as the collective farmers sent food and clothing to the Red Army fund during the war, now they are sending seeds and livestock to farms in the west. In 1943 Kazakh collective farmers sent over 200,000 head of cattle, some of which must have been previously evacuated.

The war stimulated the production of grain and some industrial crops like cotton declined slightly. Precisely the same effect was found in British agriculture. The sown area in the U.S.S.R. has been enlarged by literally millions of acres. In the Kazakh republic and Western Siberia the arable area grew by two and three-quarter million acres. Similar expansion took place in the other Central Asian Republics, and they helped to counteract the loss of the fertile Ukraine. In 1942 almost half of the usual sown area was in German hands.

Just as in Britain, agricultural labour was short. Women, older men, and school children from 12 to 16 spent their summer holidays helping with the harvest. Courses of training in practical agriculture were given in many schools.

Russia had her "dig for victory" schemes too. Many factories adopted a whole farm, and worked it during spare time, and thus guaranteed an unbroken supply of vegetables, meat and milk for the canteen and the workers. Home gardening also increased on allotments in town and country. Moscow alone boasted a million allotment holders.

In order to use the potato reserves to the best advantage the scientist Lysenko started a nation-wide campaign to increase the planting of potatoes

by cutting off the tops¹ and planting these whilst the remainder was eaten for food. This proved successful since potatoes were in demand as a source of starch, cattle food and alcohol to make synthetic rubber. In 1942 about 250,000 acres of allotments and farms were planted with potato tops, and the difficulties of preserving the tops until sowing time was overcome. We have already noted how new plants for the production of rubber expanded in acreage since their discovery just before 1940.

Necessity is most certainly the mother of invention, for not only were new areas placed under sugar-beet but large-scale tapping of wild maple and birch trees took place in order to obtain sugar from the sap. It must be remembered that three-quarters of the sugar-beet area was wiped out during the war.

We thus see how Soviet Russia has become one of the greatest food and industrial crop producers in the world, and also how the foresight of her leaders enabled her to feed and clothe her people at home and at the front during the Second World War. Victory would not have been possible but for the development of agriculture and industry in the lands beyond the Volga. It now remains to describe the basis of Russia's industrial might.

¹ The end which is used is that where the eyes are grouped and is called the "rose-end."

CHAPTER VIII

INDUSTRY IN THE SOVIET UNION

SOME features of the distribution of industry in Tsarist Russia have already been noted (pp. 134-137). The general appearance of this distribution lacked balance, and was lop-sided. Three-quarters of the large-scale industry which existed in 1914 was concentrated in a few urban areas of the west. These constituted St. Petersburg, the Moscow district and the Donetz Basin—a mere 6 per cent of the whole country. The non-Russian lands of Siberia and Central Asia were looked upon as sources of raw materials. In fact, 95 per cent. of the cotton textiles were manufactured in the Moscow and Petersburg areas. The raw material had thus to travel over 2000 miles from Central Asia. Similarly, the bulk of Russia's coal was centred in the Donetz region, which produced 87 per cent., whilst as much as 97 per cent. of oil production came from the Baku area in the Caucasus. The same was true of iron and steel manufacture. Over three-quarters of the iron-ore was smelted in the Ukraine between the Dnieper and the Don valleys. However, the greater part of this metal was not made into finished products in the south, but was sent to Moscow and St. Petersburg. The machine-building industry was associated with these two cities but its development was feeble. Neither combines nor tractors were made and locomotives were small and few. Even scythes were imported. The main points to notice are: that industry was not found near its raw materials, nor was the finished product made near its market. This involved the placing of a great strain upon a poor transport system.

By 1928 both agricultural and industrial production had almost reached the 1914 level, and so the First Five Year Plan was launched. This plan was succeeded by two others in 1933-1937 and in 1938-1942. The new Five Year Plan for the rehabilitation and development of the national economy became law in March 1946 and will cover the period 1946-1950. All these have proved of great interest to geographers. It is the first time any government has made plans for industry and agriculture to embrace so wide an area as a sixth of the earth's surface. In 1928 a gigantic construction of new enterprises was begun. The problem was to find the best and most rational distribution of industry. This imposed on the government a deliberate policy of building industry near both raw materials and power resources, and at the same time of arranging for unfinished goods,

like pig-iron or copper, to be worked into the finished article with the minimum waste of labour and transport.

By using for the first time the vast undeveloped resources of the Soviet Union, the government hoped to make their country economically self-supporting in both peace and war. The first step was to create a heavy industry. This in turn produced the tractor which, as we have seen, helped agriculture to feed the new industrial workers. It is not difficult for the tractor plant to be transformed into a tank factory, and the tractor driver into a tank man, and so the defence of the country fitted into the great Five Year Plans. It is now agreed that the world owes a great deal to these plans which in 1928 were looked upon by the rest of the world as merely an experiment in socialism, the State taking charge of the production of both agricultural and industrial commodities.

As will become clear later, the "centre of gravity" of Russian industry began to move, after 1928, from the old centres of the west towards the Urals, Central Asia and Western Siberia. The two main ideas behind this part of the plan were : to raise the standard of life of the people who had previously been ignorant nomads. The Uzbek women removed the veil which had been the symbol of slavery for centuries and worked in the new textile mills built where the raw cotton actually grew. Secondly, it was dangerous for Russia's main centre of production to be in the west. This could easily spell disaster in time of war. The Second World War actually saw the older areas overrun by the fascist enemy, but thanks to the eastward shift of the industry, war production was maintained and the factories of the west "leap-frogged" to the Urals and the Kuzbas, where sites had been prepared in the new industrial areas of Soviet Asia. The danger had been foreseen years before and plans laid accordingly.

The industrial might of the U.S.S.R. is so vast that a geographical survey presents some real problems. As a result, it has been thought best to describe the main industries of the U.S.S.R. in turn, and finally to summarise the geography of the "industrial giants," showing the interaction of one industry with another. It is possible to divide the industries into two big groups :

1. *Industries which create the means of production.* These are the major industries which produce *power* ; and the *heavy industries* which make goods and machines to produce, in their turn, other articles of use to the ordinary consumer. This first group of industries manufactures capital, or producers' goods, as the economists call them. Thus steelworks produce steel which is later made into spades or cameras.

2. *Industries which produce articles to use.* These factories take the raw materials of agriculture, or heavy industry, to make such things as boots and shoes, motor cars and silk stockings. These industries produce consumers' goods.

INDUSTRIES WHICH CREATE THE MEANS OF PRODUCTION

1 *The Industries which create Power*

(a) *The Coal Industry*

Coal is found in plenty throughout the Soviet Union and the coal reserves are exceeded only by those of the U.S.A. In point of fact, the International Geological Congress fixed them in 1937 at the enormous figure of 1,654,000,000,000 tons. This represents 20 per cent. of the world's resources and is over ten times greater than the reserves of the British Isles. Despite this astronomical figure the U.S.S.R. was only fourth in world production in 1937¹ with a total of 128 million tons. It is not possible to record the latest figure but it is easy to imagine that during the Second World War the production of the Urals and Siberian fields would have increased whilst it will take some time for the Donbas to reach again the 1938 figure of over 80 million tons.

The Donetz Basin, or the Donbas as the Russians call it, had in 1938 more than trebled its output of 1913; this field accounted for something like 60 per cent. of the country's total in 1940. It can be seen, therefore, that this coalfield is still the "coal scuttle" for the whole Union (Fig. 93). During the Five Year Plans the former small mines and adits were replaced by larger and fewer mines some of which were producing up to 5000 tons per day. The Donbas coal is of the best quality

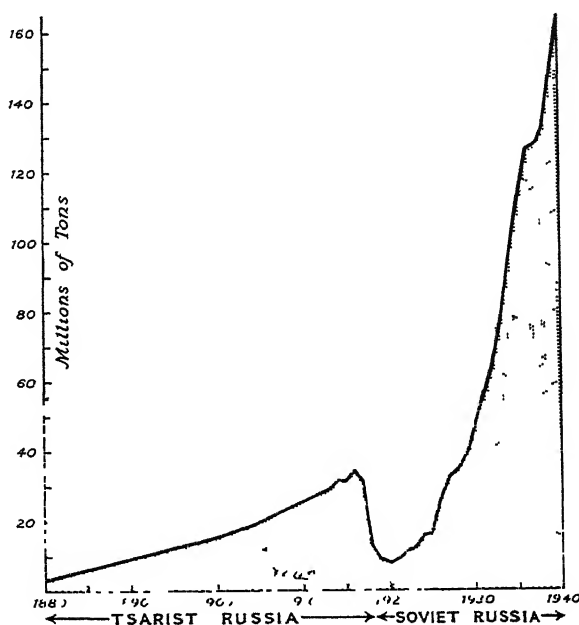


Fig. 92.—COAL PRODUCTION IN RUSSIA
FROM 1880 TO 1940.

The steep rise in production dates from the First Five Year Plan in 1928. The effect of the Civil War and the period of foreign intervention is most apparent.

¹ Fourth after U.S.A., British Isles and Germany.

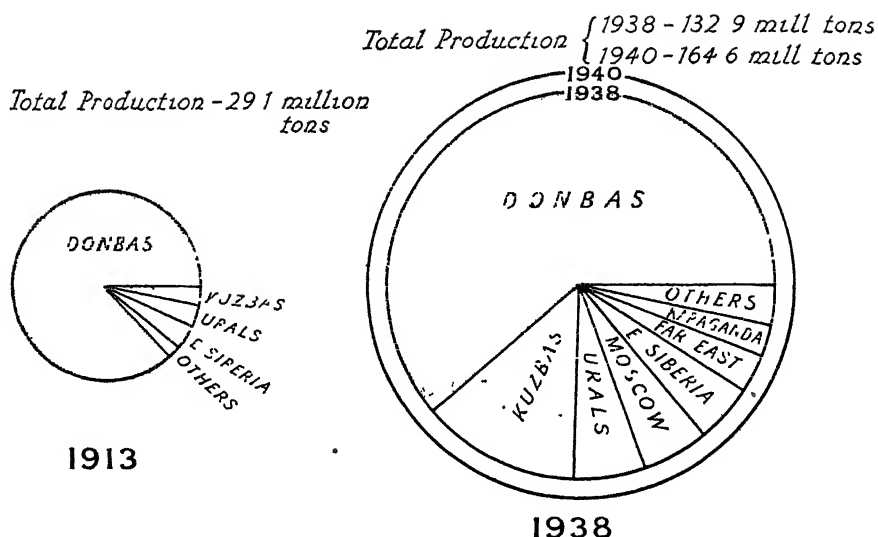


Fig 93 —RELATIVE IMPORTANCE OF THE COALFIELDS OF THE U S S.R.
IN 1913 AND 1938.

Even though the total output of Russian coalfields increased between 1913 and 1938 the Donbas remains the most important single field. Notice the appearance of new coalfields in 1938.

and ranges from coking-coal to anthracite.¹ Before 1941 many of the mines were highly mechanised and used coal-cutters, pneumatic picks and conveyer-belts with electrical haulage, and compared favourably with the best pits in this country. They also had batteries of coke ovens, with by-product plants turning out all the many chemical, and coal-tar products.

It was at Gorlovka in the Donetz that the new and revolutionary technique of underground gasification of coal was tried on a semi-commercial scale in 1937. Scientists had long speculated with the idea of turning coal into gas whilst it was still in the seam, thereby dispensing with underground mining. The Russian Mendeleev wrote about it as early as 1888 and, about 1913, the British geologist Ramsay drew up a plan for experiments to be carried out in Durham. Lenin noted these ideas but it was left to Stalin to suggest experiments. These were successful, for in 1933 gas was obtained for the first time from an anthracite colliery at Shakhty, just north of Rostov-on-Don. It has now been found possible to control

¹ As in the anthracite mining areas of South Wales and Pennsylvania the actual winning of the coal is not easy for the strata have been much dislocated. The Donbas is a down-faulted and down-folded geological basin as well as being in the drainage basin of the River Donetz.

combustion in the coal-seam by varying the blast of air. The usual method is to have two shafts connected by a horizontal gallery, the coal being ignited by electricity. Oxygen or steam-blast can be used instead of air. This results in the outlet gases having different compositions and they can form the basis of chemical plants for the production of ammonia, nitric acid and fertilisers.

Before 1940 other stations were built at Lisichansk and Kurakhovka in the Donbas and in the Moscow area. The Germans destroyed all these and work is beginning once again on this new development which will do much to economise on labour and transport, and dispense with the really hard work of cutting shafts and galleries in a coalmine. It is estimated that the number of workers required for these plants is about a quarter of the number normally used in a coalmine of similar size. The product can be led directly to the consumer through pipes, thus saving much handling and transport. Many difficulties have been encountered, but the Third Five Year Plan of 1938 forecast new developments in all coalfields, which would reduce the need for many of the underground workings. The day when all underground work ceases, and when collieries resemble modern power stations, is still in the future. However, the Russians are confident for they now say "there is nothing to hold us back."

Another innovation took place in the Donbas in 1935. A coalminer called Alexei Stakhanov realised that if he worked his pneumatic drill all the time instead of pausing to clear away the coal or to make the roof secure, his own personal output, as well as that of the whole team, would increase. Others were to be employed to do the incidental tasks. When this idea was tried out Stakhanov hewed over 100 tons of coal in one shift, which was about forty times the normal. This new approach to work became most popular and the Stakhanov movement is now applied to all industries. Keen workers are rewarded for reducing the number of operations and speeding up the job wherever possible. However, quality is not sacrificed for speed.

The Kuznetsk basin, or Kuzbas, is now second in output (see Fig. 93). Its reserves are enormous, being estimated at 400,000 million tons, which alone is greater than twice the reserves of England. To put it another way, if the consumption of coal remained constant, Kuznetsk could supply the whole world for 300 years. There are many good seams, the total thickness of which is over fifty feet. These coal-beds tend to be less disturbed and nearly horizontal in contrast to those in the Donetz. In twenty years, the Kuzbas has developed rapidly, and in 1936 employed over 35,000 miners.

The main coal-basin lies to the south-east of Novosibirsk along a tributary of the Ob, called the Tom ; with Kemerovo and Stalinsk as the other chief centres. Kuzbas coal is excellent for the manufacture of metallurgical coke and contains even less sulphur than the Donbas coal. This region has been completely transformed in twenty years and is now a great

industrial complex. In contrast, the 774,000 tons which were mined in 1913 went entirely into the tenders of the engines working along the Trans-Siberian railway.

Table 4

PRODUCTION OF COAL IN MILLION TONS

Coalfield	1913	Percentage	1938	Percentage
Donbas (including Caucasus and Black Sea coast)	25 3	87	80 7	61
Kuzbas	·77	2 7	17 3	13
Urals	1 2	4 2	8 1	6 1
Moscow	3	1	7·4	5 6
Eastern Siberia	·82	2 8	6·8	5 1
Far East	·37	1 3	4 7	3 5
Karaganda	—	—	3 9	2·9
Central Asia	24	·5	1·2	·7
Transcaucasia	07	2	·5	47
Others	·1	3	2·3	1 13
U.S.S.R.	29·17	100·0	132·9	100·0
			1940	
			164·6	

Even Kazakhstan now has its coalfield and, although the present production of this Karaganda coalfield is not large, there are over 60,000 million tons of coal beneath the surface of the dry steppe-lands lying between Lake Balkash and the Ural Mountains. Karaganda is planned to become the third coal centre of the U.S.S.R. with an output of more than 10 million tons. Many shafts are being sunk and older ones transformed and mechanised. The Kostenko mine is one of the largest and can produce 2 million tons of coal per annum. This coalfield is now linked to the T.S.R. and Lake Balkash, and although the coal has a fairly high ash-content it can be used on the railways and in the copper-smelting plant on the shores of Lake Balkash.

Coal has been known to exist in the Urals for a long time, but it suffers from the defect of having a high ash-content and does not make good coke. Much of it is the lower-grade brown coal, or lignite. However, since it has been agreed to develop local resources despite their poorer quality, the Urals produce over 8 million tons. Coal with a high sulphur-content is mined at Kizel, and it has been used to make coke for the copper-smelting



Plate 42 —COALMINERS AT A KUZBAS COLLIERY

The Kuznetsk Basin (Kuzbas) of the Upper Ob valley in Siberia is now the second coalfield of the U S S R. The tonnage raised is rapidly rising and the mines are modern and well equipped. The miners use all the latest safety gear—notice the head-lamps. These three men have exceeded their quota and are Stakhanovites

works at Sverdlovsk. Brown coal is also found at Chelyabinsk, Bogoslovsky and Yegorshina, and more and more use is being made of open-cast workings with the help of great mechanical excavators. Production doubled during the Second World War, so the tonnage will now be close on 20 million tons, much of which will be used for electric power stations as well as for other industrial purposes.

The Moscow region always used to burn the high-quality coal from the Donetz, despite the fact that large reserves of brown coal were situated in the Tula region, only about a hundred miles to the south. Now the Moscow coal-basin is producing about 18 million tons and new methods of burning it have made it suitable for the new electric power stations of the region and the large chemical works at Stalinogorsk. Other areas of brown coal are in the Borovichi district south-east of Leningrad, and along the right bank of the Dnieper.

This, however, does not exhaust the coal industry of the U S S R. New

mines are being sunk in the Far East which serve as the basis of power in these newly developing industrial areas. A little to the east of Vladivostok there are mines at Suchan and Artem : there are others up the left-bank tributary of the River Amur, called the Bureya. Where possible, use is made of the open-cast method of working. Between the Amur valley and the Kuzbas there are several other coalfields at the foot of the great mountain ranges which form the boundary here. There are mines at Cheremkhovo as well as at Minussinsk and Kansk, near Irkutsk, where more brown coal is obtained.

Much geological investigation has been undertaken in the difficult region of the Arctic Tundra and the vast forestlands of the Yenisei and Lena basins. It is in the area of the Tunguska River, which is a tributary of the Yenisei, that a large field is known to exist. It has been estimated to contain 400,000 million tons. There is some mining along the Lower Tunguska valley and near Norilsk, situated near Igarka, well within the Arctic Circle. These mines supply the coal which is now used to fill the bunkers of the ships sailing along the Northern Sea Route. This Arctic fleet was operating in 1940 entirely on coal from these Arctic fields. These mines were planned to have an output of $1\frac{1}{2}$ million tons in 1942. A certain amount of the coal is also used by river steamers. There is one other Arctic field on the Vorkuta, a tributary of the Pechora, and only 120 miles west of the Ob. This augments the supplies for the northern fleet, but in 1944 actually sent 10,000 tons to Leningrad. The coal on this field is of good quality and makes excellent coke (see Fig. 94).

The Central Asian republics are not without coal, and their mines produce over one million tons annually. There are mines at Angren, near Tashkent, and in the Naryn valley, a tributary of the Upper Syr Darya, in Kirghizia.

Transcaucasia, especially Georgia, has a quota of solid fuel. Mines are to be found in the west, near the centres of Tkvarcheli and Tkivbuli.

Mention must be made of two other sources of power from low-grade fuels. Firstly, the U.S.S.R. has the most highly developed *peat industry* in the world. This is found in the swampy forestlands of the Moscow, Leningrad and White Russian areas. Peat was used as a fuel during the emergencies of war-time, and special furnaces now burn peat for the generation of electricity. In all, production reached over 25 million tons in 1938. In order to save time, special plants have been built near Leningrad, Moscow, Yaroslavl and Kalinin to dry the peat artificially.

The other type of fuel is *combustible shales*. These are used in the Leningrad region for fuel and for the distillation of benzine products and other chemicals. In 1942, 14.8 million tons were worked and some was used by the Kashpira heat and power station near Kuibyshev, and by another station of slightly less capacity (120,000 kw.) at Saratov on the Volga.

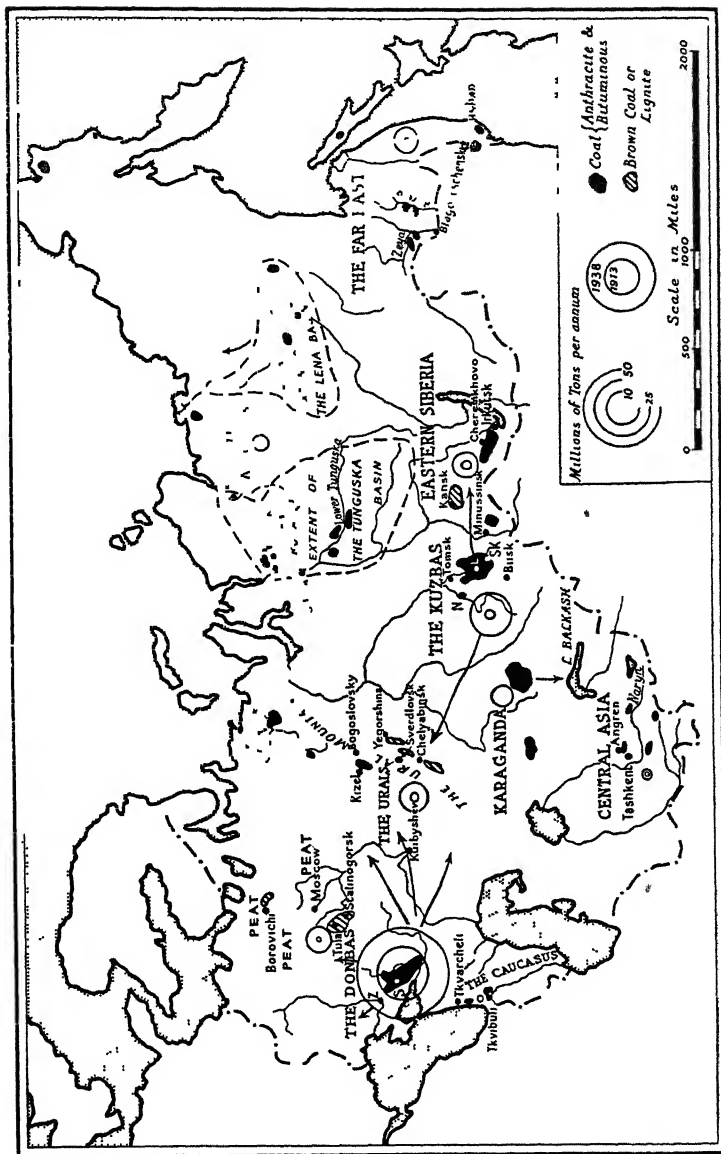
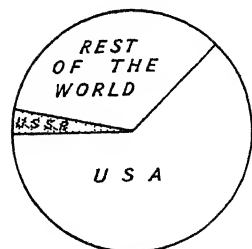


Fig. 94.—THE COALFIELDS OF THE U.S.S.R. SHOWING THE PRODUCTION OF EACH FIELD IN 1913 AND 1938.

Notice that extensive coalfields are known to exist in the basin of the Lena and Tunguska Rivers, but they remain as yet undeveloped. N=Novosibirsk, Sk=Stalinsk, L=Lenninsk, S=Stalino, Z=Zaporozhe.

(b) *The Petroleum Industry*

Petroleum is vital to a modern state. Just as coal produces steam, heat, electricity and some petrol products, all important driving-forces, so, few tractors, cars or lorries could run without petroleum, few aircraft could fly and many ships could not sail. The Soviet Union now occupies second place in the world after U.S.A. for the production and refining of petroleum. In 1938 the reserves were assessed at 8,700 million tons, with about half this amount proved. This assessment is also about half the known resources of the world.



World total = 268 million tons

U.S.S.R. total = 30.4 million tons

Fig 95.—THE PRODUCTION OF OIL IN THE SOVIET UNION COMPARED WITH THE U.S.A. AND THE REST OF THE WORLD (1938)

The main centre has always been, and still is, the Eastern Caucasus. The concentration of this industry in 1913 was even more pronounced than the coal industry. About 97 per cent was accounted for by the two centres of Baku on the south side and Grozny on the northern side. Since 1930, the aim has been to develop other oilfields. These have been found and they now account for about 10 per cent. of the total output. The strategy of the Nazi drive into the Caucasus during 1942 when Maikop and the Grozny areas were reached, was to deprive the Red Army tanks, planes and lorries of their oil supplies. Oil was the goal, and Baku looked insecure but was fortunately situated south of the Caucasus. It was with these eventualities in mind that great efforts were made to explore other oilfields, if possible in less vulnerable localities.

In the Caucasus the chief oilwells are on the Apsheron Peninsula, upon which Baku itself stands. Other wells extend north of the Azerbaijan republic into Daghestan and into the Grozny district, along the Terek and Argun valleys. In the Western Caucasus, the main producing region is in the Maikop area along the minor tributaries of the Kuban River.

The annual production of the Caucasus region is about 30 million tons of crude oil. A considerable amount of this is refined on the oilfield, or at the ports of Baku, Batum, Tuapse and Makhach-Kala (see Plate 79).

Baku on the Caspian, and Batum on the Black Sea, are linked by rail and by two pipe-lines, one of which carries crude oil and the other paraffin. These pipe-lines carry about $2\frac{1}{2}$ million tons per year and are a little over 500 miles long. As can be seen on Fig 96, the Caspian port of Makhach-Kala is linked by pipe-lines with Grozny, Rostov-on-Don and the town of Nikitovka in the Donbas, with an off-shoot serving the ports of Tuapse and Krasnodar.

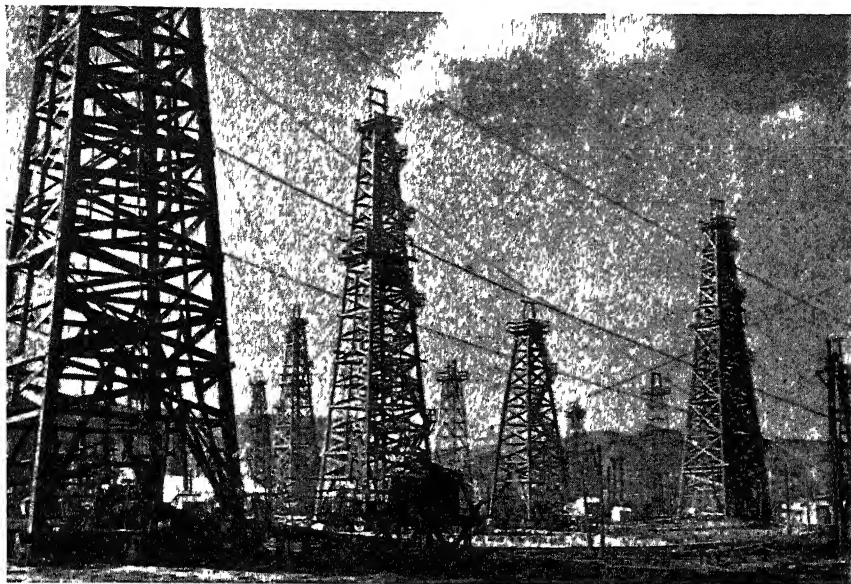


Plate 43 —OIL-DERRICKS NEAR BAKU

The Baku region in the Republic of Azerbaijan is the most productive of petroleum. Pipe-lines and tankers take the crude oil and there are refineries in the port area

It has now proved possible to obtain petroleum from under the Caspian Sea by sinking well-bores obliquely, or by placing the derricks on piles. On the Caspian shores opposite Baku, oil is now obtained from the region behind the small port of Krasnovodsk, which is also the terminus of the Central Asian Railway system in Turkmenistan.

The most important new oilfield, however, lies between the western flanks of the Urals and the Volga, especially on either side of the River Kama, the Volga tributary from the Urals. This field has been called by the Russians, the "second Baku." Small seepages of oil and asphalt had long been known in this area, but it was not till 1929 that oil was discovered in quantity during exploratory borings for potash salts. Then followed a period of active prospecting, and oil was struck near the centres of Ishimbayevo, Tুমaz, Syzran to the east, and to the west of the Volga bend at Kuibyshev. In 1938 the production from seven centres was 550,000 tons, and the "second Baku" area as a whole produced from 1.5 to 2 million tons.

Some of these wells have proved to be "gushers," and the prospects of the "second Baku" are most favourable, for the petroleum-bearing region covers an area a hundred times greater than the Baku region in Azerbaijan.

As a result of geological investigation, there is now good reason to believe that the oilfield may extend west and south-west beyond the Volga, towards Moscow and the Donetz Basin.

The "second Baku" is developing like the parent oilfield and has a pipe-line to the Volga river ports. In addition, there are refineries at Ufa, the Bashkir capital, as well as at Ishimbayevo and Sterlitamak on the oilfield.

This field is linked with a further oil-bearing region extending from the foothills of the south Urals to the Caspian Sea near where the Ural River and the Emba flow into it. This is called the Ural-Emba field. The quality of the oil is good, and a pipe-line links the town of Orsk with the port on the Caspian called Chapaev (Guriev).

Further oilfields have been found, and are being developed, in the north, east and south of the Soviet Union. A small tributary of the Pechora, called the Ukhta is the site of new oilwells and the first refinery was installed in this Arctic area in 1936. Farther east on the Arctic shore at Nordvik a rich oilfield has been discovered, which could supply fuel for polar aviation and both sea and river transport.

In the Far East the chief oil-producing region is Soviet Sakhalin. The east coast port of Okha exports most of it, but a pipe-line has been constructed to the west coast of the island, and recent reports say that this is being extended under the Tatar Strait to the port of Nikolayevsk at the mouth of the Amur. A refinery and three "cracking"¹ installations have been built at Kharbarovsk. Both the oil and coal supplies of Sakhalin were vulnerable to attack from a hostile Japan and, therefore, oil reserves in the lower Amur valley and in Kamchatka have been recently developed with the result that the output of 360 9 thousand tons in 1938 was reported to have been increased to 700,000 tons in 1941.

Between the Arctic and the Far East, gas- and oil-bearing rocks have been found in the Lena valley in Yakutia. Oil-derricks are being built in the lonely and deserted taiga.

Apart from the Krasnovodsk region in Turkmenia, there are other oilwells in Central Asia, e.g. the Khaudak wells in Uzbekistan, and others to be found in the Ferghana valley.

An interesting fact about oil is that it represents the decomposition of vegetable matter into a liquid which is found occurring in the pore spaces of certain sedimentary rocks. Oil is most frequently associated with limestones and sandstones, and especially when these rocks have been folded into up-folds (anticlines) or domes. The oil is usually kept in the limestone pores by means of an impervious cap-rock, like clay or shale (Fig. 98). It may so happen that the oil distils naturally into crude oil, or petroleum, and natural gas. This gas may be under pressure. Therefore, if a well is sunk at A only gas is obtained. At B oil can be pumped out of the well,

¹ *Cracking* is the breaking down of heavy oils into lighter fractions by heat treatment.

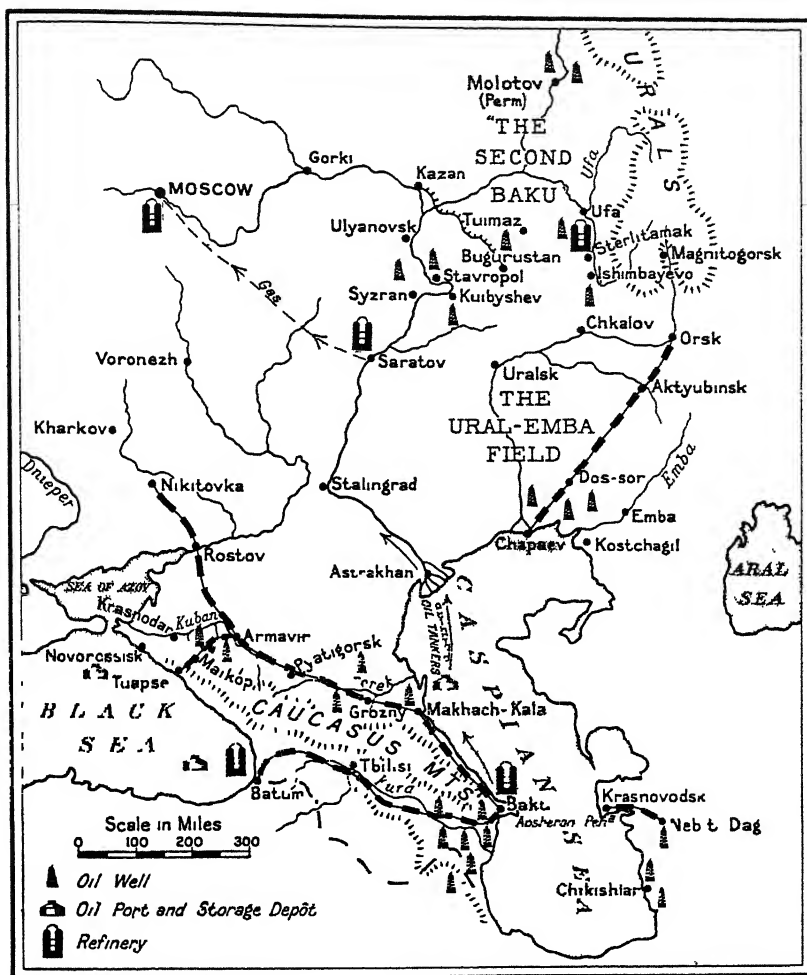


Fig. 96.—THE MAIN OILFIELDS OF THE U.S.S.R. SHOWING PIPE-LINES AND REFINERIES.

The major oilfield is associated with the young folded mountains of the Caucasus and the older rocks lying between the Ural Mountains and the River Volga and the Caspian Sea. Notice the pipe-line which is being built between Saratov and Moscow to carry natural gas.

and if the gas is untapped and is under sufficient pressure, the oil may be forced out at B as a "gusher." If the well is sunk at C in a downfold it may happen that only water is available. The natural gas is now valuable as a source of fuel and is found on all the oilfields. Much was formerly lost, but the gas is being used in oil refineries, or to light up mines, and even to produce carbon-black. The resources of natural gas are thought to be about the same as those in the U.S.A.

A pipe-line for carrying gas (methane) has been under construction from the "second Baku" at Saratov, on the Volga, to Moscow, and is due to be completed in 1945. It is over 480 miles long, crossing rivers, lakes and roads. The gas will be used as a fuel in Moscow for the central heating of houses and hospitals, in addition to being used in bakeries and in electric-generating stations in summer, when the demand from other consumers is smaller.

The technique in the oilfields is being rapidly improved. New fields are being discovered by magnetic and geophysical methods. Wells can be bored to over 10,000 feet, and whereas it used to take $2\frac{1}{2}$ years to sink to 2000 feet such a depth can now be bored in about 3 to 5 days. Refineries are most modern, with research stations attached to them. The valuable

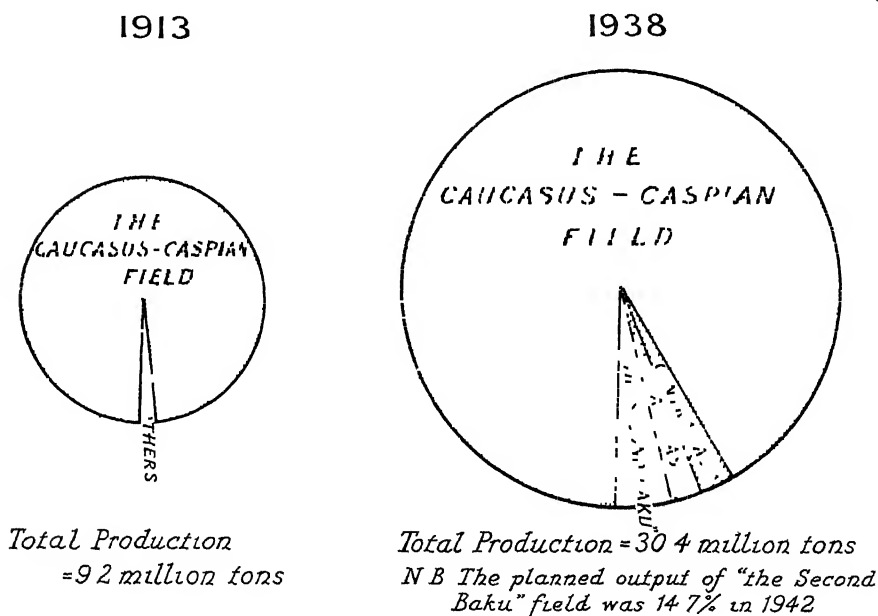


Fig. 97.—THE RELATIVE PRODUCTION OF THE DIFFERENT OILFIELDS IN THE U.S.S.R. IN 1913 AND 1938.

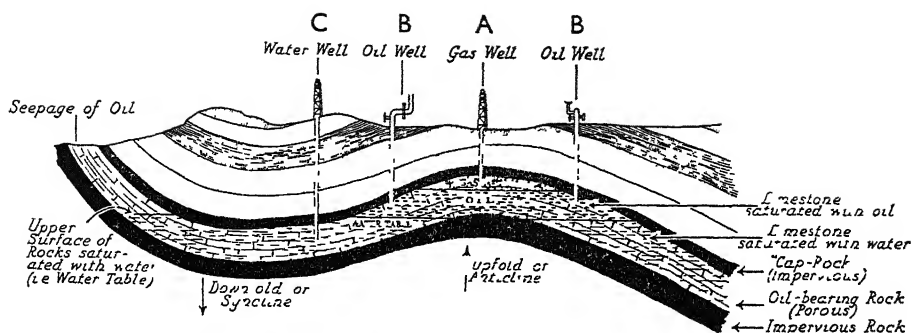


Fig. 98.—A SECTION ACROSS A TYPICAL OILFIELD.

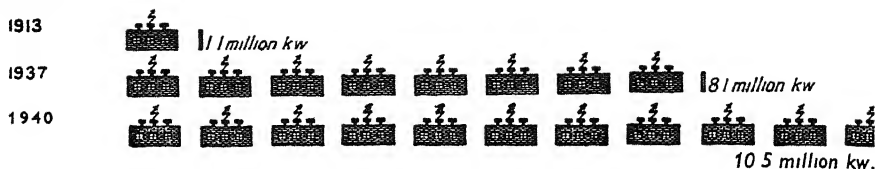
by-products are also becoming increasingly important. For example, ethylene for the synthetic rubber industry (see p. 239) is obtained from the "cracking" plants of Transcaucasia. It is also interesting to notice that some of the water pumped from the ground in oil-bearing regions contains iodine, bromine and potassium salts in solution. This fact helps as a clue in prospecting; and iodine and bromine are now extracted, in commercial quantities by plants near Baku, Emba and in Central Asia. Even the wells are made to yield more, and the rate of yield has been speeded up by forcing air, or steam, at 600° C. and at 6 atmospheres pressure, down the well shaft. In this way, the oil is forced out of the pores and into neighbouring wells.

(c) *The Electricity Industry*

Modern industry tends to use electricity for its motive power, the main reason being that electric power is easily transported, and can be used far away from the main source of the energy, whether this is obtained from coal, peat or falling water. Nevertheless, it is the ultimate source of the power which largely determines the siting of the generating plants. Thus the thermal-electricity plants are either on the coalfields or in the regions where peat is found; whilst the hydro-electric stations are situated on rivers which have waterfalls or steep gradients, and at the same time maintain a fairly steady volume. The tendency in all countries is for the various electricity stations to be linked by a grid, or network, of high-tension cables. This allows solid fuel to be the main supply for the network during that part of the year when the rivers are at a low volume, or frozen over. The U.S.S.R. is no exception to this general practice.

Electricity is used in many occupations, and its application to agriculture covers a wide field. The oil industry is completely mechanised and electrified, electric haulage is used in mines and quarries. Again, many branches of metallurgy, including the refining of ores, depend upon

CAPACITY



PRODUCTION OF ELECTRICAL ENERGY

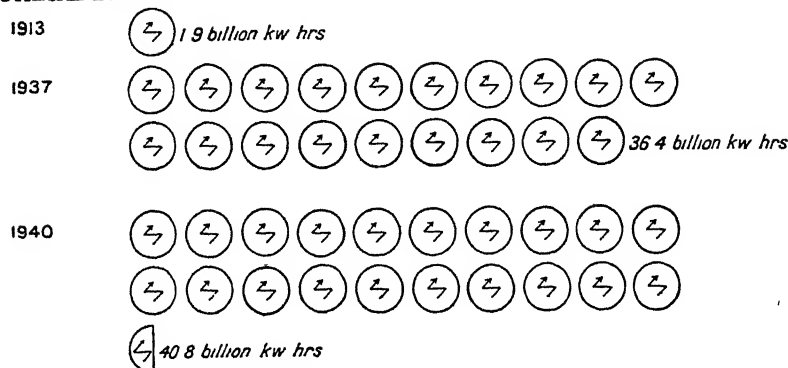


Fig. 99.—THE CAPACITY AND TOTAL PRODUCTION OF ELECTRICAL ENERGY OF THE POWER STATIONS IN RUSSIA IN 1913, 1937 AND 1940.

it. The U.S.S.R. is now developing heat and power stations to a greater extent than any other country. In this way hot water and electricity are made available to industrial and domestic consumers by means of a network of cables and pipes. Thus the water used for cooling generators, or the hot water from any other industry, can supply the bath and washing water in a house, instead of being cooled in a water-cooler and the heat thereby completely wasted. Such projects are relatively easy in the U.S.S.R., where industrial and power development are planned at the same time and do not grow up piecemeal.

Lenin readily recognised that electricity was the basis of industrial development, and as we have seen above, p. 140, the plan for the electrification of Russia was drawn up in 1920. "Goelro" also included the restoration and reconstruction of existing plants, and the construction of thirty new power stations with a total capacity of 1.5 million kilowatts. This plan was completed in 1930.

The electric power stations of Tsarist Russia were few, and of low capacity. The largest hydro-electric plant had a capacity of only 1350 kw., and in 1913 the total capacity of all plants was 1.1 million kw. By 1940



Fig 100.—MAP SHOWING THE TYPES OF ELECTRICAL STATIONS TO BE FOUND IN THE WEST AND SOUTH-WEST OF THE U.S.S.R.

Coal is still the main source of electrical power, but more and more use is being made of inferior fuels like brown coal and peat.

this had increased almost ten times ; whilst the actual output in kilowatt-hours increased over twenty times between 1913 and 1940 (see Fig. 99). Even in 1935 over three-quarters of Soviet factories were run on electric power, which showed a rapid transformation.

When dealing with the source of electric power it is important to notice that solid fuel (coal, peat and brown coal) still provides most of the power.

In 1932 coal supplied over 70 per cent, whilst water-power only accounted for 8 per cent. and petroleum 17 per cent. These figures will now be different, but water-power, although it had increased to 18 per cent. in 1937, has not superseded coal and petroleum. All of the larger coalfields have their thermal-electric stations and the general policy is to use local fuel, even though it is of an inferior type.

In the Moscow region there are two large stations, at Kashira (186,000 kw.) and Stalinogorsk, which use brown coal, whilst others at Shatura (180,000 kw.), Ivanovo and Balakhna, near Gorki (204,000 kw.), depend on peat. These stations help to make the Moscow power system the biggest in Europe, and even as early as 1936 the total capacity was some 800,000 kw.¹

Near Leningrad, peat is also used, as at Dubrovka and the Red October station. However, in the Donbas there are many stations using coal, as at Dnieprodzerzhinsk, and there is one at Mariupol, near the Sea of Azov, which uses coal-dust. This supplies electricity to the Azovstal iron and steel works, and hot water to hospitals, schools and houses. The Urals, the Kuzbas and even the small coalfields of the Caucasus and the Far East all have their thermal-electric stations.

On the other hand, there seems to be more romance about the hydro-electric power stations. There is, of course, the epic story of the Lenin Station on the Dnieper. This station, with a capacity of 558,000 kw., was designed to supply electricity to the Dnieper region and its many inter-related industries, as well as to remove the interference of the rapids at Zaporozhe, where the hard crystalline rocks outcrop in the river's bed. The dam had a stairway of locks for steamers, a three-sectioned sluice, and

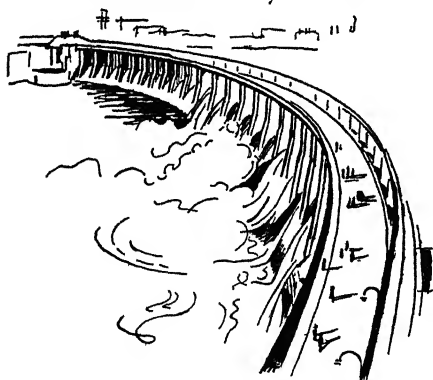


Fig. 101 — THE DAM OF THE DNEPER HYDRO-ELECTRIC POWER STATION BEFORE IT WAS DAMAGED IN THE SECOND WORLD WAR

was half a mile long, and over 200 feet high. It was started in 1927 and completed in 1932. Then it will be remembered that the Russians destroyed it as part of their "scorched-earth" plan in the retreat of 1941. It was partly restored by the Germans, and then badly destroyed when they retreated in 1943-1944. Thousands of workers are now employed on its further reconstruction which began in March 1944. It is hoped that an even bigger and better dam will be finished in 1948.

About seventy miles east of Leningrad stands the first Soviet station ever to be built. It was

¹ 1 kw. is almost equal to $1\frac{1}{2}$ h p.

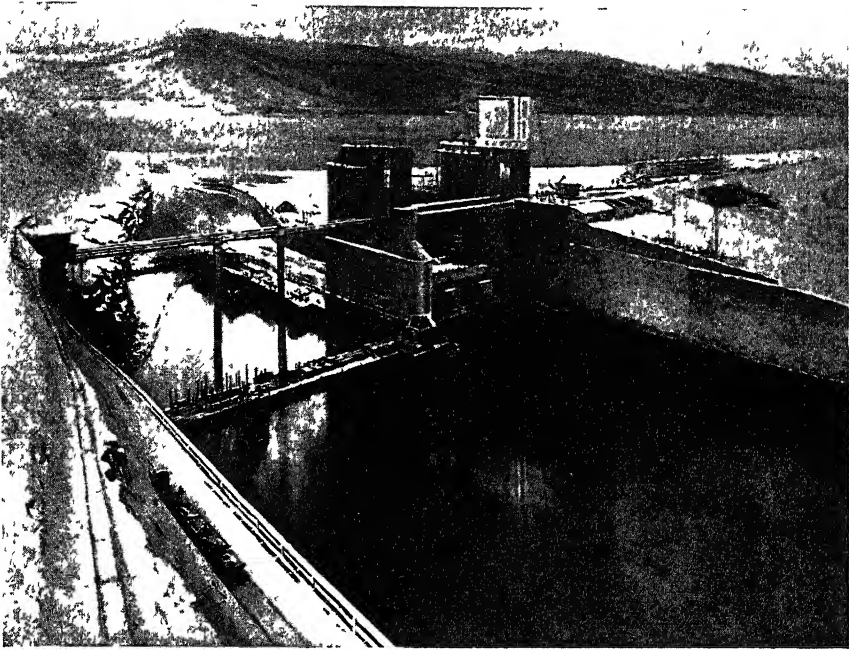


Plate 44.—THE ELECTRIC POWER PLANT, TULOMSK

This photograph is taken from a painting of the Tulomsk Power Station in the Arctic Circle. It is situated near Murmansk, which is at the mouth of the Tuloma River.

completed at Volkhov in 1926 on the river of the same name, which joins Lake Ilmen with Lake Ladoga. This is much smaller (58,000 kw) than the Dnieper station which was regarded as a memorial to the work of Lenin. There is now a larger station on the Svir which links the two largest European Lakes—Ladoga and Onega. This provides Leningrad with power, and the construction has improved the navigation of the River Svir. This station was finished in 1936, and has a capacity of 96,000 kw, which is quite a remarkable achievement when it is realised that this huge concrete structure was built on soft, swampy clay and sands.

Even greater difficulties were faced by the builders of the two stations beyond the Arctic Circle. One is the 60,000 kw station at Niva, near Kandalaksha, on the White Sea. This is now linked with another, of 50,000 kw. capacity, on the Tuloma River, a little south of Murmansk, and they both help to supply the new mining and industrial area near Kirovsk and Monchegorsk.

In the Caucasus, there are several stations which depend upon petroleum for their fuel, as at Krasnodar, and the Black Sea port of Novorossisk. However, by far the greatest potential source of power in this region is to be found in the many mountain torrents, some of which have already been harnessed. In Georgia, waterfalls on the Khrama, a tributary of the Kura,¹ just south of Tbilisi (Tiflis), are the site of a 90,000 kw. station. Another at Rionsk, on the Rion River, supplies the electric trains which link Batum and Baku as well as the ferro-manganese plant at Dzhugeli. In Armenia, the great Lake Sevan has an area of 550 square miles, and provides a natural reservoir fed by the Caucasus snow-melt. It stands over 6000 feet above sea-level and is drained southwards into the Araxes by the torrential Zanga. Work began in 1933 to use some of this water-power, and already two stations have been completed at Kanakir (88,000 kw.) and at Gyumush (263,000 kw.). Eight stations are planned to utilise the drop of over 3000 feet from Lake Sevan to the Araxes valley, in addition to the construction of an artificial lake to be used as a supply of water to irrigate over 300,000 acres of land in the semi-desert area of Sardanabad (see Fig. 100).

The two demands for water, by agriculture and by the power stations, dovetail with each other; for summer and spring are the periods when irrigation is most necessary, whilst autumn and winter are the periods when the electric stations need most water from the reservoirs. It is at this season when those stations which rely on the melt-waters from the snowfields face their keenest water shortage. However, it is obvious that water can be used for irrigation after passing through the penstocks of the electric stations.

The Allahverd copper-smelting works, cement works, a synthetic rubber plant and the machine plant at Erivan are some of the power-consuming industries of this region in Armenia.

The most ambitious scheme of all is that of the Volga and its major tributaries, the Oka and the Kama. This has already been mentioned, in that water and power for irrigation will be provided (see pp. 158 and 266). The navigation along the Volga will also be improved, for previously it has been possible to wade across the river between Rybinsk and Kalinin during the low-water period of summer. Many of these great constructions were nearing completion in 1939, especially the hydro-electric stations of Uglich, Rybinsk and Ivankovo, with a combined capacity of 470,000 kw., which will form a great link in the Moscow net (see Fig. 102). Rybinsk was half finished in 1945 when the third of its 55,000-kw. turbines was switched

¹ In 1945 work was resumed on the Mingechaury Dam which is in Azerbaijan and located on the Kura River about 160 miles west of Baku. The capacity of the generating station will be 300,000 kw., but in addition, it is hoped to regulate the flow of the Kura and the Araxes and so increase the area of irrigated land to the size of Northern Ireland [4 million acres].



Fig. 102 —THE MAJOR HYDRO-ELECTRIC POWER PLANTS OF WESTERN RUSSIA.

Notice the relationship between the building of dams, hydro-electric power stations, improvements in navigation of the rivers, canals and irrigation works.

on. Two turbines were put into operation at Uglich, forty miles up-stream from Rybinsk, in 1940. Work at Rybinsk was actually taking place when the Germans were launching their attack on Moscow, and the first turbine began to turn in November 1941. This helped to keep Moscow supplied with power. Similarly, turbine No 3 was being built at the Electrosila plant during the siege and bombardment of Leningrad.

Work on the great hydro-electric centre at Kuibyshev is being resumed after the war. When completed the capacity will be 3,400,000 kw. There will be seventeen turbine generators of 200,000 kw capacity, and the two stations will be at either end of the great bend in the Volga. Some idea of the size of the project can be gained from the facts that thousands of workers will have to lay over 400 million cubic feet of concrete, and parts of the turbines will have to be machined on the spot. When completed it will be larger than the Grand Coulee dam in U.S.A.

Central Asia now has its own power stations. In fact, Uzbekistan has over sixty stations, all of which have been built since 1929. The new station on the Chirchik River, near Tashkent, has at present a capacity of 270,000 kw. and supplies power to a chemical plant which produces fertilisers for the cotton-fields, or explosives in time of war. In the Chu valley of Kirghizia the Chumysh dam provides power as well as irrigation water. Work was started in 1943 on another station in Central Asia near the settlement of Farkhad.

Further schemes have been devised to use the immense water-power of the large rivers lying east of the Urals. There are great possibilities along the Angara as it leaves Lake Baikal. This natural lake will, of course, regulate the flow, which is always an advantage. Eight stations are planned with a capacity of over 9,000,000 kw.¹ and when completed they will serve the T.S.R. and the Cheremkhovo coalfield. It would also be possible to construct other stations along the Yenisei system and on the Irtysh, the main tributary of the Ob.

Many of these schemes are to become realities in the future, but much has been achieved since 1920. Nevertheless, the Soviet Government will continue to be far from satisfied so long as the use of electricity per head of the population is less in Russia than in the advanced industrial countries like U.S.A. and Britain (see Fig. 103).

Two new developments are interesting. Firstly, although "giant" stations are technically very efficient, they take years to build and the tendency is now to concentrate on building a large number of smaller stations which are to be distributed in all regions of the U.S.S.R. Big stations will, of course, still be built. Secondly, small wind-driven power generators have been built in the Crimea and the Caspian regions since 1934. In 1936 there were 1300 of these on collective and State farms. They are mainly of about 5 kw power but one, on a peak near Yalta, has

¹ This is about twice the potential capacity of the Niagara Falls

1913	U.S.S.R.	Gt Britain	U.S.A.	France	Germany
PIG IRON	■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■
STEEL	I	I I I I I	I I I I I I I I I I	I I I I	I I I I I I I
COAL	•	• •	• •	• • • • •	• • • • • • • • • • • • • • •
ELECTRIC POWER	⚡	?	⚡⚡⚡⚡⚡ ⚡⚡⚡⚡⚡ ⚡⚡⚡⚡⚡	?	⚡⚡⚡⚡

1937	U.S.S.R.	Gt Britain	U.S.A.	France	Germany
PIG IRON	■	■ ■	■ ■ ■	■ ■	■ ■ ■
STEEL	I	I I I	I I I I	I I	I I I
COAL	•	• • • • • •	• • • • •	•	• • • • •
ELECTRIC POWER	⚡	⚡⚡⚡	⚡⚡⚡⚡⚡	⚡⚡	⚡⚡⚡⚡

Fig 103—THE RELATIVE OUTPUT PER HEAD OF POPULATION OF THE U.S.S.R., GREAT BRITAIN, U.S.A., FRANCE AND GERMANY IN 1913 AND 1937

The total output of pig-iron, steel, coal and electric power in the five countries have been divided by the number of people in each country. In every case the production of the U.S.S.R. has been taken as one unit. The figures for 1913 and 1937 show that the position occupied by the Soviet Union as an industrial power greatly changed during that period.

a capacity of 10,000 kw and supplies the town and its local industrial needs.¹

It is now necessary to review the heavy industries which rely on coal and coke to smelt the iron and make the steel, oil to lubricate the bearings and electricity to drive the wheels.

¹ These do not exhaust all the possible sources of power, for experiments are being carried out on the use of solar radiation. The sun's rays are concentrated by large mirrors and lenses, and "heliogenerators" have been set up in the sunny region of Central Asia. The strong winds of the Arctic are also used.

(2) *The Heavy Industries which produce Raw Materials to make other articles*

(a) *The Iron and Steel Industry*

The iron and steel production of a country serves as a good indication of its industrial position. In addition, the iron and steel industry is essentially important for defence, and is the basis of engineering and construction works. These industries in Russia passed through phases of development similar to those of Britain. There was a time when iron was smelted in the Urals by charcoal, but later the Donbas became the main centre, for here iron-ore was found occurring alongside coal. The industry of the 1913 period showed the same over-concentration apparent in other industries, for 74 per cent of the pig-iron and 64 per cent of the steel was produced in the Ukraine and the adjacent areas. In any case, the production of pig-iron in 1913 was only 4.2 million tons compared with 10.2 million tons for Great Britain at the same time. This seems most meagre, when in 1937 it was estimated that the reserves of iron-ore in the Soviet Union were 10,600 million tons. Actually in 1913, the great Russian Empire produced less pig-iron than a small country like Belgium. If production per head of population is compared, the results are even more striking (Fig. 103).

During the war period 1917-1922 pig-iron production fell to 115,000 tons and so the new Russia had to start its heavy industry almost from scratch. In 1929 steel production had reached the pre-1913 level and from this date, development has been rapid.

In 1939 the relative world position of the U.S.S.R. in heavy industries was very different. Iron-ore production had increased to 26.5 million tons in 1938 in the U.S.S.R. Pig-iron production reached 14.9 million tons in 1940. The corresponding figures for the U.S.A. were 70 million tons of iron-ore in 1940 and 31.9 million tons of pig-iron. It can be seen in Table 5, that in 1940 Soviet Russia was only surpassed by U.S.A. and Germany in the production of the basic goods, pig-iron and steel.

Table 5

ACTUAL OUTPUTS OF POWER AND IRON, COAL AND STEEL

(After Sumner in part)

	U.S.S.R. (1940)	Great Britain (1937)	(1941)	U.S.A. (1939)	France (1938)	Germany (1938)
Pig-iron (mill. tons)	14.9	6.7	7.4	31.9	6.0	18.3
Steel (mill. tons)	18.4	10.3	12.3	47.2	6.1	22.7
Coal (mill. tons)	164.6	227.0	206.3	395.0	45.5	186.0
Electric Power (mill. kw. hrs.)	40,800	30,700	—	115,900	19,300	55,200

Prior to the invasion of the Ukraine in 1941 the metallurgical region lying between the Donetz and the Dnieper was still the major centre of the U.S.S.R. Of the 28 million tons of iron-ores mined in 1940 in the whole



Plate 45.—EXTRACTING IRON-ORE IN A MINE AT KRIVOI ROG.

Modern mining technique like pneumatic drills and picks are used. The mines of Krivoi Rog, some 200 miles west of the Donbas, are still the most important. In 1937 the Ukraine accounted for over 60 per cent. of the total pig-iron output in the U.S.S.R.

Soviet Union, two-thirds came from the most important mines of Krivoi Rog. These iron-ore deposits are found in the elbow of the Dnieper and are of high grade, yielding about 60 per cent. of iron. Most of the ore is carried by rail to the blast furnaces of the Donbas, a little over 300 miles away. In this way, the ore is taken to the coke, which is quite a common arrangement. Stalino is the main metallurgical centre of the Donbas and it had, in 1940, seventy-eight batteries of coke-ovens which produced $8\frac{1}{2}$ million tons of high-grade coke. This was used in over twenty blast-furnaces. The district is also well provided with numerous outcrops of limestone, dolomite and fireclay which are used in iron and steel manufacture. At Stalino, Makeyevka and Kramatorsk there are steelworks in addition to blast-furnaces. Most of the furnaces are of the "open-hearth" or "Siemens-Martin" type and they convert the pig-iron into steel. In a later process the ingots of steel are placed in "rolling" or "strip and bar-mills" where the heated blocks of steel (called "blooms and billets") are rolled into long bars, rods and various other shapes.

Not only does the iron-ore travel to the coke for smelting, but the trucks

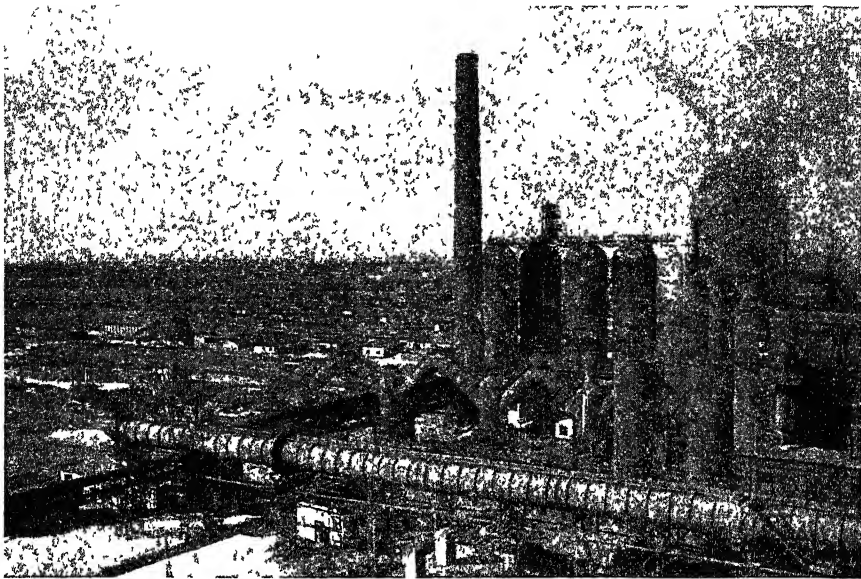


Plate 46 —IRON AND STEEL WORKS AT KRIVOI ROG

Blast-furnaces have been built here to make pig-iron. The coke is obtained from the Donetz Basin, thus railway wagons have a full load travelling both eastwards and westwards. Notice the flat plain of this part of the Ukraine and the houses of the people

return to Krivoy Rog laden with coke for new iron and steel works which have been built on the iron-field. This eliminates the large-scale movement of empty trucks.

To the south, on the Kerch peninsula of the Crimea bordering the southern shores of the Sea of Azov, there are even more extensive deposits of iron-ore. These are lower-grade ores, which contain about 30 per cent iron, but they occur in beds up to 25 feet thick. These ores are shipped to Taganrog and Mariupol along the northern shores where there are pipe-rolling plants, blast-furnaces and other open-hearth steel furnaces. It is at Mariupol that the Ilyich and Azovstal works have been built. This is an example of coke and iron-ore meeting half-way at a point of transshipment and near a small port. The boats which take the iron-ore from Kerch return with coal and coke from the Donbas, and there are now iron and steel works at Kerch. Coke is therefore brought to the iron-ore field.

The second great iron-mining region is situated in the Ural Mountains. The principal source of supply is a mountain of iron-ore called Mt. Magnet. Small quantities of ore were smelted with charcoal as early as 1747, but even in 1913 the production never exceeded 50,000 tons. It was during the

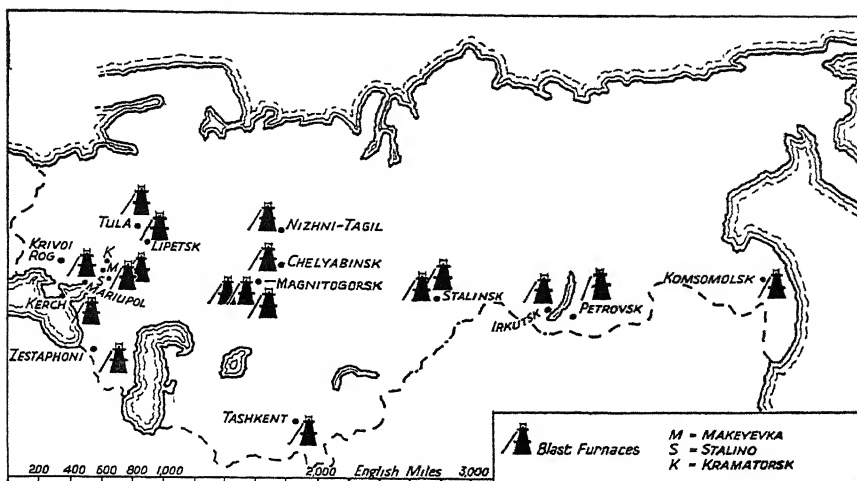


Fig 104.—CHIEF CENTRES PRODUCING PIG-IRON AND STEEL IN THE U.S.S.R.

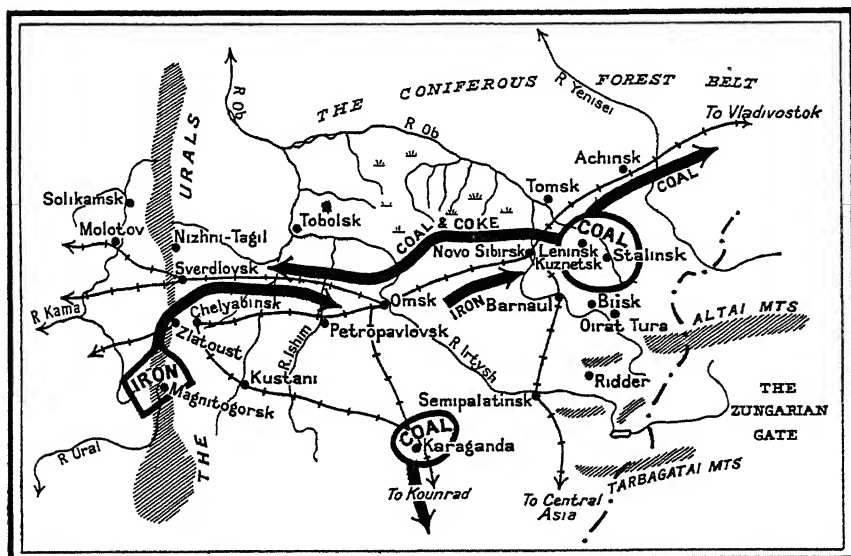
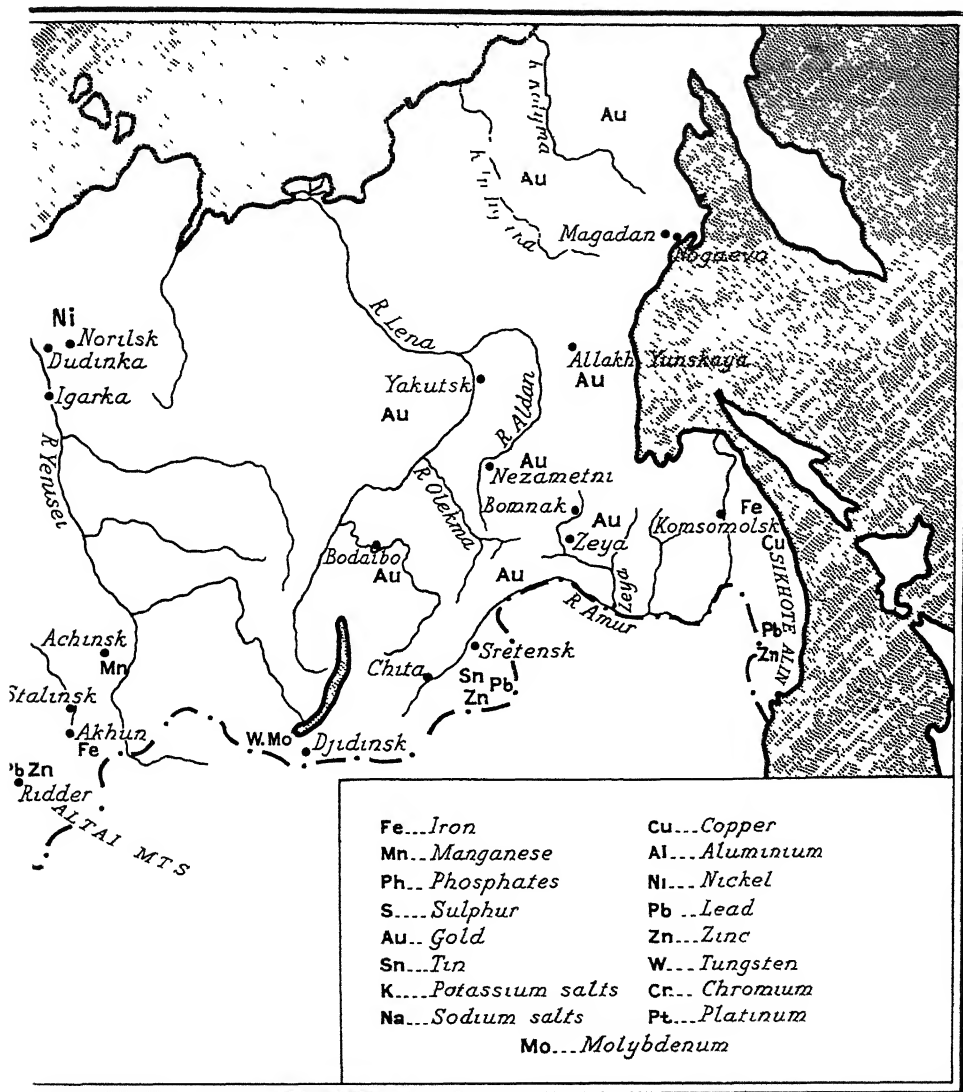


Fig 105.—SKETCH-MAP OF THE URALS AND THE KUZBAS.

This map shows the inter-connection between the industrial regions of the Urals and the Kuznetsk Basin (The Ural-Kuznetsk Combine.) The scale is about 500 miles to one inch



Fig. 106.—THE CHIEF DEPOSITS OF Ordzhonikidze near Chiaturi, was formerly called



ECONOMIC MINERALS IN THE U.S.S.R.

Vladikavkaz and has now been renamed Dzauzdikau.

first Five Year Plan that this huge supply of magnetite iron-ore, of the order of 450 million tons, was first worked on a large scale. This magnetite iron-ore is very rich indeed, for 100 tons of ore will yield about 60 tons of metallic iron. However, the main difficulty for the development of blast-furnaces in the Urals was that good blast-furnace coke was lacking. The solution adopted was the formation of the Ural-Kuznetsk Combine which linked iron-ore with coal and coke. Coke from the Kuzbas now travels 1250 miles to the Urals and, instead of returning empty, the trucks carry iron-ore from Mt. Magnet to the Kuzbas. Thus iron and steel works are located at either end of the line and form complementary industrial areas (see Fig. 105).

Other iron-ore deposits are worked in the Urals at Zigazinsk, Nadezhdinsk and Khalilov (see Fig. 106), but the Magnet Mountain deposits are by far the most important. To work these ores the metallurgical centre of Magnitogorsk has been created. That is literally true, for before a decision taken by the Soviet Government in 1929 the centre was virtually non-existent. Work started the same year and Magnitogorsk then had a population of 146,000, which was estimated to have grown to 400,000 in 1943. The story of this "mushroom-town" is reminiscent of the gold-rush towns of the American continent. It grew from nothing, being founded on the right bank of the Ural River as a town of tents, where nomads of the steppes, Russians, Tatars, American negroes and industrial engineers lived all together under most difficult conditions. In the Soviet Union it was regarded as a great honour to have been a pioneer of *Magnitostroi*¹. By 1943 the sixth blast-furnace, which was Soviet-made, began production, and in 1944 the seventh coking battery was working. It should be realised that not all the coke comes from Kuznetsk. The output of pig-iron in 1938 from only four furnaces was 1.8 million tons, despite the fact that blast-furnace No. 1 was not blown before February 1932. Now there are in addition open-hearth furnaces, a blooming mill, an electric power plant, while the entire Magnitogorsk combine covers an area of over thirty square miles and employs 35,000 workers.

There are other iron and steel plants in the Urals as at Chelyabinsk, where a new iron and steel mill was built in 1944. Open-hearth and Bessemer furnaces are situated at Chusovaya and blast-furnaces at Nizhni Tagil.

At the other end of the axis, in the Kuzbas, there are the Stalin iron and steel works at Stalinsk itself, where pig-iron was first produced in April 1932. There were four blast-furnaces in 1937 and the usual open-hearth steel furnaces and rolling mills, which produced rails and sheet metal. Stalinsk, now the chief centre, had grown from the small village of Kuznetsk to a large industrial town of 170,000 people in 1939. During the Third Five Year Plan it was realised that to carry ore and fuel over a thousand

¹ *Stroi*=in construction

miles was a strategical weakness as well as a strain on transport, since the Stalinsk mills alone use 70 truck-loads of raw materials every hour of the day and night. Attempts are therefore being made to find a way of coking the coal of the Urals and to develop any local iron-ore deposits near the Kuzbas. Such deposits have now been found about 100 miles to the south of the Kuzbas, in the Shoria Highlands at Akhun, and manganese ore at Mazul only 400 miles away. This is an important new development.

In addition to the Ukraine and the U.-K. Combine there are newer and, as yet, smaller centres of heavy industry. Near Irkutsk, on Lake Baikal, there are deposits of both iron-ore and coal. This has led to the reconstruction and the extension of the old works at Petrovsk. The other iron and steel works are situated on the Lower Amur at Komsomolsk. Each plant has at least two blast-furnaces and rolling mills and the output from both areas was estimated at 100,000 tons in 1942. The first rolling mill in the Far East began production only ten days before Hitler's assault on the Soviet Union (22 : 6 : 41). It is these new centres of heavy industry which supply the raw materials for the engineering and shipbuilding works of the Far East, and the needs of the Red Banner Far Eastern Army. Komsomolsk is the "City of Youth," and was started like Magnitogorsk as a pioneer industrial settlement. It was built entirely by the members of the Young Communist League (Komsomols). They were offered an inducement of 30 to 50 per cent. bonus on the normal rates of pay and exemption from certain compulsory sales to the State if they were engaged in agriculture. The coal for the blast-furnaces is obtained from the Bureya field, and iron-ore comes from the Little Khingan mountains along the right bank of the Amur.

Similarly, the first iron and steel works were built in Central Asia during 1944. They are in Uzbekistan along the Upper Syr-Darya, near Tashkent. Georgia too, in the Caucasus region, has a new iron and steel centre.

It has already been noted that in 1913 the Central Region, as it was called, of Petersburg, Moscow and Voronezh, used most iron and steel but only produced 5 per cent. Even this situation is changing, for more iron and steel is being produced in the region itself, which now accounts for 8 per cent. of the total pig-iron, and about 18 per cent. of the total steel. This has been helped by the discovery of large reserves of low-grade ore to the south of Kursk. The chief works are at Tula and Lipetsk, and farther afield the Red October works at Stalingrad had four open-hearth furnaces and two rolling mills which are now being rebuilt.

Thus the tendency is, as in agriculture, to develop a more balanced and rational production. It is aimed to develop engineering and finishing processes, like wagon-building or agricultural machine-building at the iron and steel centres, rather than have some areas sending pig-iron and



Plate 47 — IRON AND STEEL PLANT

The Kuzbas is rapidly becoming one of the major industrial areas of the U.S.S.R., blast-furnaces and all types of engineering works.

semi-finished steel miles across country. Thus in the language of the economist, there is a greater tendency to vertical integration of the metallurgical industry.

(b) *The Mining and Smelting of Non-Ferrous Minerals*

Manganese is a most important key metal used in steel production. It is added to the steel in order to prevent the formation of oxides and sulphides of iron in the final product. It renders the steel tougher and of greater tensile strength. The U.S.S.R. has very great reserves, of approximately 750 million tons, and led the world with an output of $2\frac{3}{4}$ million tons in 1938. The chief deposits are in the Dnieper bend below the dam at Nikopol, which figured frequently in the news of the Second World War, for the deposits were coveted by the Germans. The Nikopol ore is used in the main by the steelworks of the Ukraine. More important deposits are worked in the Caucasus at Chiaturi, in the republic of Georgia. The ore is refined near by, and also at Poti on the Black Sea coast. A considerable amount of these supplies go to the Urals and Kuzbas. Stalinsk is also supplied by the mines near Achinsk, which lies on the T.S.R. about 100 miles to the west of Krasnoyarsk (see Fig. 106).



KUZNETSK BASIN.

, the chief centre, lies in the valley of the Tom River and has coalmines, steelworks, photograph is reminiscent of a South Wales valley.

Titanium-bearing Iron-ores are found both in the Urals and in the Kola Peninsula. Various compounds of this rare metal are used in making white paint, in steel manufacture and for the production of "smoke screens."

Vanadium can be recovered from the iron-ores of the Kola Peninsula and also from Kerch. Small amounts are added in the steel furnaces in order to give special properties to steel. Only .2 per cent. is needed for the production of high-speed tool-steels.

Nickel is another valuable metal which, depending on the amount used, imparts many properties to steel, e.g. increased tensile strength, resistance to rust and abrasion, or high-resistance to an electric current. The U.S.S.R. is not a great nickel producer, for almost 90 per cent. of the world production comes from the Sudbury district of Ontario. However, nickel deposits are found in the Central and Southern Urals, and the first nickel works were built in 1933 at Ufalai near Chelyabinsk. There is now the South Urals Nickel Combine working the deposits found near Orsk and Aktyubinsk which may soon become the "Sudbury of Russia." A North Nickel Combine was built in the Kola Peninsula, near Monchegorsk, where low-grade nickel ores are found. It will be remembered that the Petsamo nickel deposits have since September 1944 been transferred to the U.S.S.R.

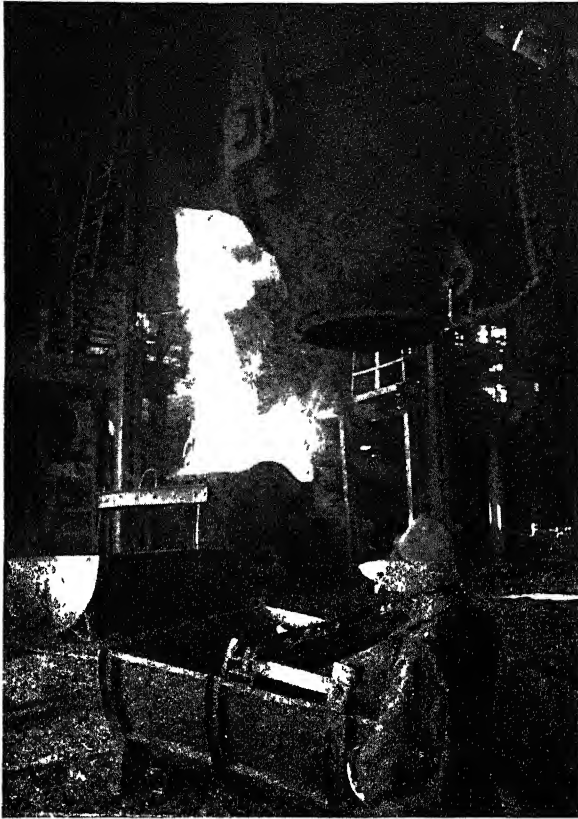


Plate 48—A COPPER-SMELTING PLANT IN
KAZAKHSTAN.

The copper deposits on the northern shores of Lake Balkash have given rise to an important copper-smelting industry near Kounrad. The coal is obtained from either Karaganda or the Kuzbas. The photograph shows one of the furnaces being tapped.

Chromium The Soviet Union leads the world in chrome-ore production and is a little ahead of Turkey, Southern Rhodesia and South Africa. Chromium is essential in special-steel production. It is used with nickel in the manufacture of stainless, non-corroding and acid-resisting steels. Such steels are of great strength, and are therefore used in the production of armour-plate, for rifles, or for warship superstructures. The main mine in the Soviet Union is about 150 miles north-west of Sverdlovsk, in the Urals.

Formerly in Finnish territory, they were worked by the Mond Nickel and International Nickel Companies of Canada, and these Anglo-Canadian interests received 20 million dollars in compensation from the Soviet Union. Right in the Arctic region of Siberia, at the mouth of the Yenisei, nickel is worked at Norilsk, near Igarka, and a small railway connects the port and the mining area. These ores contain about 4 per cent nickel.

Cobalt This metal is not plentiful and is usually associated with copper and nickel. However, some is found in the Urals, and it is used to produce the blue colour in glass and also in the production of high-speed cutting tools. Often it is mixed with chromium, tungsten and molybdenum.

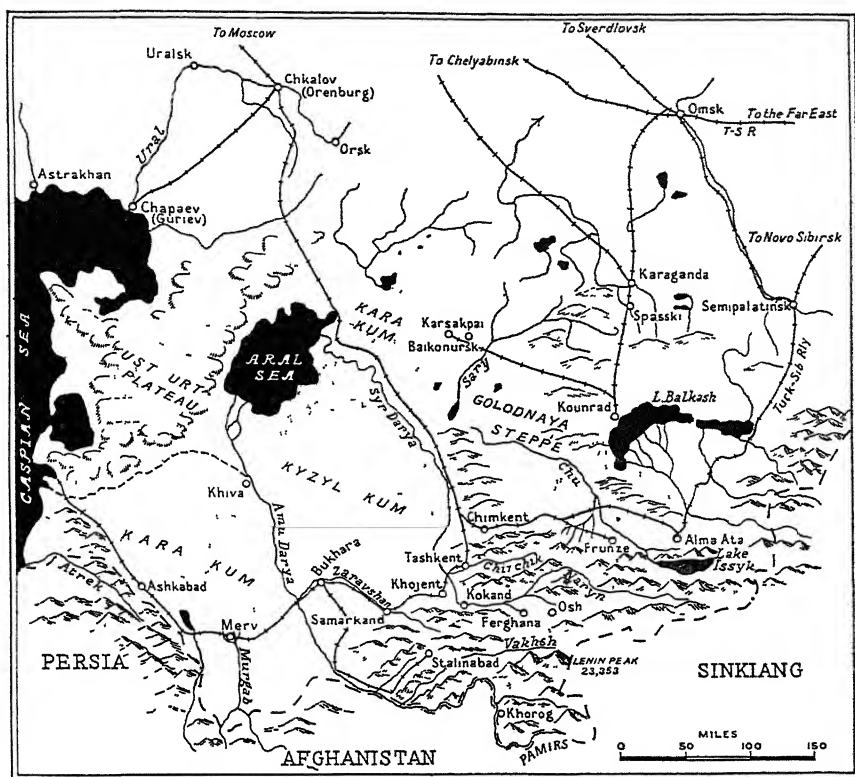


Fig. 107.—SKETCH-MAP OF SOVIET CENTRAL ASIA.

This region of inland drainage and of large desert tracts lies north of the great mountain ranges of Central Asia.

Molybdenum. The U S S R. has small reserves in the Caucasus, the Altai mountains and the Far East. Tyrny Auz, near Nalchik, is quite an important source of both molybdenum and tungsten. The first smelter was built on Lake Balkash in 1940. This mineral is yet another important constituent of alloy steels, especially for making machine tools and for excavating and drilling machines.

Tungsten This is likewise made into ferro-tungsten for high-speed tools. The ores are mined in the Urals between Sverdlovsk and Magnitogorsk and are smelted at Chelyabinsk. Recently, the Dydinsk Tungsten Combine has been erected on a new ore-body south of Lake Baikal. It will be remembered perhaps that tungsten is also used for the filaments of electric lamps.

Copper Extensive copper deposits are now being worked in the dry steppe-land of Kazakhstan. The largest copper-smelting combine is on the northern shore of Lake Balkash near the Kounrad copper mine about fifteen miles away. This Pribalkash combine smelts about 7400 tons a year. The region is now linked to the coalfield of Karaganda by rail. The copper ore is not very rich, containing only about 1 per cent copper, but there is plenty of it, since the estimated reserves are $2\frac{1}{2}$ million tons. The total reserves for the U.S.S.R. were placed at 19.3 million tons in 1937, that is about 8 per cent of the world's resources. West of Lake Balkash, larger deposits are being worked at Djezkazgan and a refinery is now in operation near by, at Karsakpai, where there are brown-coal deposits near Baikonursk, the terminus on the Karaganda branch line (see Fig. 107). No modern industrial country can do without copper. It is indispensable in making electrical apparatus. Its alloys, bronze (copper 80 per cent. + tin 20 per cent.), brass (copper and zinc), as well as the aluminium-copper-magnesium-alloy called duralumin, have innumerable uses. Duralumin is used in aircraft construction.

There are other copper mines in Armenia near Dashkezan and Zangezur, with refineries at Kafan and Allahverd, as well as in the Urals near Orsk and Khalilov; while the central Urals copper-smelting combine is at Revda near Sverdlovsk. Other workings are to be found in the Far East, on the Pacific slopes of the Sikhote Alin range of mountains (Figs 106 and 118).

Lead and Zinc. These two metals usually occur together as sulphides which generally line the walls of mineral veins (Fig. 108). The U.S.S.R. comes very much behind the U.S.A., Australia and Canada in the world production figures. In 1938 the U.S.S.R. produced 80,000 tons of zinc and 44,000 tons of lead, compared with the corresponding figures for U.S.A. of nearly 500,000 tons of zinc, and over 300,000 tons of lead. All industrialised countries use large amounts of both lead and zinc. Lead is made into storage batteries and used as a covering for electric wires and cables, as well as being used in paints and the manufacture of ammunition. Zinc also has many uses. It is mixed with copper to make brass, and a great deal is used to "galvanise" corrugated-iron and wire-netting. The chief lead and zinc mines are in the Caucasus at Sadon in the Upper Terek valley near Ordzhonikidze.¹ The oldest workings are in the Ridder field of the Altai mountain region, in the Upper Irtysh valley. These mines have been worked since 1727 when Demidov excavated copper, lead and silver to make samovars and church bells, among other things. Other important lead mining regions are in Kazakhstan at Chimkent north of Tashkent, and near Tetiukhe in the Far East.

Aluminium. This metal has become of vital importance, and it is a well-known fact that the British people gave up their saucepans to make " Spit-fires". The main source is from a mineral called bauxite, which is really

¹ Now called Dzauzikau

a hydrated oxide of aluminium ($\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$). Until about 1937, the main supplies came from some low-grade deposits at Tikhvin, a little over 100 miles east of Leningrad. Since bauxite is smelted by electrolytic methods the plant is situated near the power station at Volkhov. Superior deposits have been developed near Sverdlovsk, and near by the Central Urals Aluminium Plant has now been established. The other large aluminium plant is in the Ukraine, associated with the Dnieper Combine and obtains its power from the Lenin hydro-electric station.

Gold The U.S.S.R. possesses very large resources of gold, about 30 per cent. of the world. It now competes with the Rand of Johannesburg for the first place in world production. The value of gold is man-made,

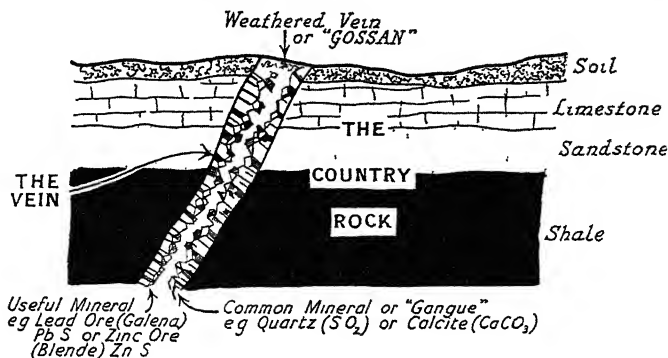


Fig. 108 — A TYPICAL MINERAL VEIN.

During periods when masses of molten rock are pushed upwards among the other rocks ("country rock"), gases and liquids penetrate farther afield in the cracks and fissures of the country rock. Since these cracks are cold the liquids and gases condense and crystallise into minerals, some being important, others being common or "gangue" minerals.

being in demand as a basis of currency and for ornamentation. Its use-value is not high. However, the Soviet Union has been enabled to pay for her imports from foreign countries by means of gold bullion when she was unable to export sufficient materials to pay for them. Recent production figures average about $7\frac{1}{2}$ million oz. per year.

Gold occurs as a mineral in veins, or else in alluvial gravels or "placers." The gold industry is a large State organisation and over 75 per cent. of the plant is mechanised. Small groups are permitted to form "artels" or co-operatives, to work old, or small, dumps; but they must sell the gold to the State. The oldest gold-mine is situated in the Urals, near Sverdlovsk, and dates from 1745. The Urals do still produce gold. However, the most important fields are to be found in the basin of the River Lena, especially near the watershed between the Lena and Amur drainage systems. Up-to-date dredgers and other hydraulic gear are used. The three rivers draining

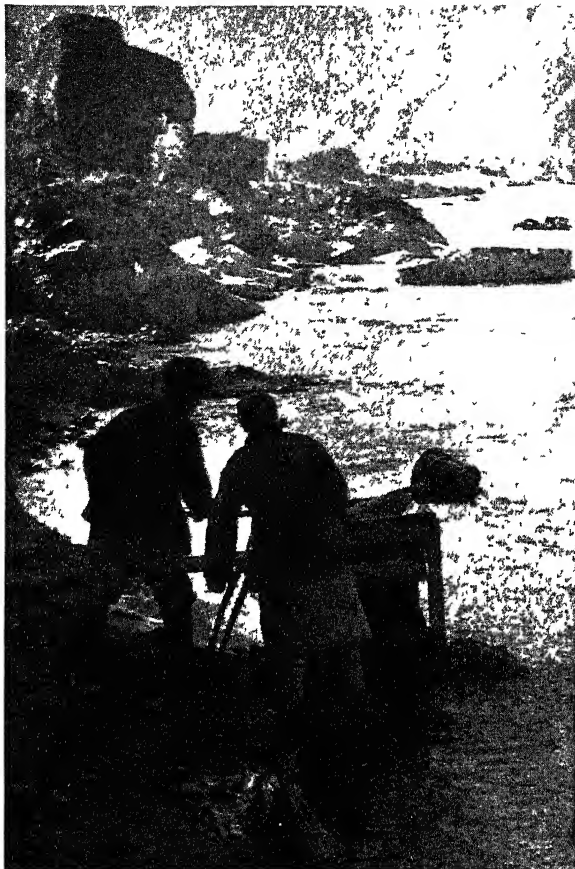


Plate 49
 PANNING FOR GOLD
 IN SIBERIA

Alluvial or placer gold is found in many of the rivers and stream beds in the east of the Soviet Union. The most notable are in the Lena River Basin. This shows somewhat primitive methods being used in the valley of the Upper Yenisei in the province of Khakass.

northwards into the Amur are the Vitim, Olekma and Aldan, and the mining and dredging operations are carried on near Bodaibo on the Vitim, at Nezametni (Aldan) and Allakh Yunskeya along the right bank of the Aldan. Flowing southwards into the Amur are the Zeya, where there are workings near the town of Zeya, and Bomnak a little farther north. Recently more gold deposits have been worked in the region of the Arctic Circle, especially along the Arctic rivers, the Indigirka and Kolyma. As a result, a motor highway has been built to provide an outlet for this region on the Sea of Okhotsk at Magadan and Nogaev (see p. 223).

Platinum Like gold, this is largely used for ornamental jewellery, but it is put to more useful purposes in the electrical and chemical industries where it is used for electrodes, for contacts, or as a catalyst. The U.S.S.R.

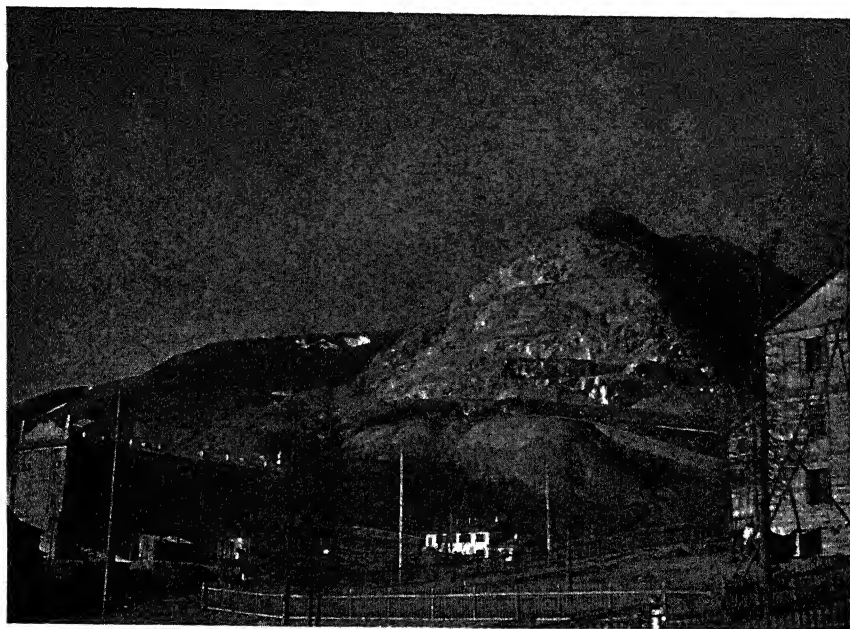


Plate 50 —THE TOWN OF KIROVSK IN THE ARCTIC.

This town of over 30,000 people has grown up recently at the foot of the Khibin Mountains on the Kola Peninsula. It is famous for its mines and quarries, some of which are visible on the hillside. The main minerals are apatite, nepheline, nickel and copper ores.

vies with Canada as the chief producer in the world. Soviet platinum is found in alluvial gravels which are derived from ultra-basic igneous rocks. The main area of supply is near Nizhni-Tagil in the Urals.

Phosphates. Scientific agriculture is impossible without phosphates, especially when it is realised that the growing of a ton of wheat extracts about 18 lb. of phosphoric acid and 12 lb. of potash from the soil. These salts together with nitrogenous material must be replaced if fertility is to be maintained. The U.S.S.R. has no shortage in this commodity, for in 1926 a huge mountain of phosphatic mineral called apatite¹ was discovered in the Kola Peninsula.

Within the Arctic Circle, the hum of industry and mining is now heard in this former land of unfrightened birds and roving reindeer-men. The chief regional centre is Kirovsk, a town of about 40,000 people. Near by, Kukis-Vumchorr mountain has been worked in several broad steps like a

¹ *Apatite* is a calcium phosphate which also contains some chlorine and fluorine $3(\text{CaO P}_2\text{O}_5) + \text{CaF}_2$.

slate-quarry, but there are now over twenty miles of underground galleries with electric lighting and electric haulage. The reserves are estimated at 2000 million tons and the quarries produce about 2 million tons a year. Thus the Soviet Union possesses over 60 per cent. of the world's supply of this important source of superphosphate ; and could herself supply the needs of the world for this artificial manure. The Kola Peninsula, however, does not exhaust her reserves, for other phosphate rocks occur in the Ukraine and Kazakhstan.

Potash and other Salts. Associated with the apatite deposits is a potash-bearing mineral called nepheline. This is now mined at the rate of about half a million tons every year. Not only is it a valuable source of potash fertiliser, but it can be used to produce aluminium, and to form a constituent of glaze for the pottery industry. These valuable deposits also supply small quantities of the rarer elements like titanium, used in alloys and as pigments in paint ; tantalum, used in lamp filaments ; as well as cerium which is used in the manufacture of lighter " flints " and gas mantles.

The greatest potash deposits, covering hundreds of square miles, are found to the west of the Urals in the Upper Kama valley, near Solikamsk. These salt deposits have been known since the days of the Stroganov family (see p. 112). Now these mines supply up to $1\frac{1}{2}$ million tons a year. A mine at Berezniki supplies an electro-chemical works which produces both magnesium and potash. Other potash deposits have been found in Western Kazakhstan.

The Solikamsk deposits supply common salt, or sodium chloride, which can also be obtained from the desiccated salt-lakes like Lakes Elton and Baskunchak near the Lower Volga.

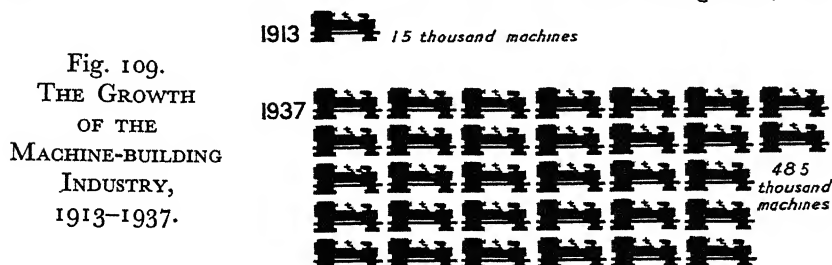
The Soviet Union possesses a unique area for the concentration of another salt—Glauber's salt or sodium sulphate. On the eastern shore of the Caspian there is a bay called Kara-Bogaz-Gol which is about 40 feet deep, covers an area of 7000 square miles and is separated from the Caspian by a narrow channel about 650 feet in length. In Kara-Bogaz the salinity of the water is over twenty times that of the main sea, which itself has a high salt-content. Along the bottom there is a bed of Glauber's salt six feet thick. Since evaporation is so great there is a strong current from the Caspian which also brings fish. As these die in the salt water of Kara-Bogaz they are gathered, ready salted from its shores, by the Turkmenians. From January to April, the south-west winds throw waves of salt on the shores and these are now scooped up by huge steam-shovels to supply a chemical plant which has been erected at Kara-Bogaz-Gol. This salt is important in dyeing, paper- and glass-making.

Thus it is clear that the Soviet Union is well supplied with most key minerals. The one exception is tin. However, this is now mined to the east of Chita in the Upper Amur valley.

(c) *Heavy Engineering and Machine-Building*

No matter what standard is used, whether it be the total money expended, or whether it be the number of metal-cutting machines, there has been a great expansion of the heavy engineering and machine-building industries. This is not surprising since no country can be truly industrialised without the manufacture of machines. These industries include the forging and casting of cranks and shafts, the manufacture of lathes and the cutting tools which are used with them. Thus machines are made to produce other machines which may be used in the home, in agriculture or on the road (Fig. 109).

In 1913 Russia used but few agricultural machines and half these were imported. Even in 1928, out of 8000 lathes that were being used, over



5000 had been imported; and when it is realised that in 1937 the Soviet Union had over 48,000 metal-cutting machines, some idea can be gained of the expansion of the machine-tool industry. The machine-building industry which did exist in 1913 was to be found in the Moscow, Leningrad and Donbas areas, and, as we have already seen, the two former regions had to depend on metal brought from the south.

Apart from the general expansion of heavy engineering there has been the tendency for all metal-producing regions to develop their own engineering works. This is the deliberate policy of the Plans, for most products of heavy industry lose weight during manufacture from the raw material to the finished article. Therefore, transport is saved if the engineering industry moves to the site of the chief raw materials. If very little weight is lost in the manufacturing processes, the industry may grow up where the products are to be used. For then it is as easy to transport semi-finished steel as it is to transport the finished motor-car or tractor. The older centres of Moscow and Leningrad have continued their machine-building, but the tendency in these areas is to concentrate on the more complex and specialised machines, because they have a ready supply of trained and skilled workers.¹

¹ This is an example of the principle of "geographical inertia." An industry tends to continue in the place where it grew up, even though many of the original factors have ceased to operate. A supply of skilled labour is one of the main factors which make for continued development of the industry on its original site.



Plate 51.

STALIN AUTOMOBILE WORKS, MOSCOW

During the Second World War much of the equipment from these works was moved to the Urals where four motor works were established. Modern mass-production methods generally associated with the U.S.A. are used, and in 1946 a new 8-cylinder car, capable of 90 m.p.h. (ZIS-110) was being put into production

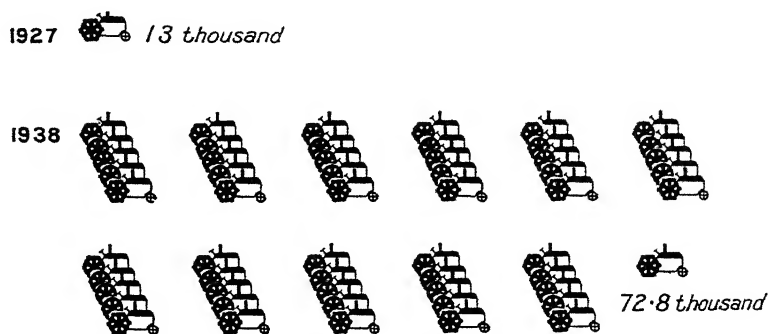
Prototypes evolved in Moscow, or engineers trained in the Moscow and Leningrad works, are sent to factories in the newly developing areas of Central Asia and the Far East

The Moscow region still remains the most important area engaged in machine-building. Here are to be found the famous Kaganovich ball-bearing plant, as well as works manufacturing all kinds of cutting and measuring tools (see Fig 141). Leningrad has large factories, like Electrosila which manufactures turbine-generators, and others making scientific instruments and machine tools. Turbines of the largest capacity, up to 150,000 kw., are manufactured at the Kharkov electro-chemical works. The great machine-building town of the Donbas is Kramatorsk, where again electric-station equipment is made, together with the machinery for textile mills, rolling mills and blast-furnaces as well as for sugar and oil refineries.

The Urals-Kuzbas axis has its centre for machine-tool manufacture in the Urals where a trust known as Uralmash is situated at Sverdlovsk, this manufactures tools, machinery and furnaces for the other industrial plants

of this region. In the Volga basin a string of engineering centres have grown up at Molotov (Perm), Yaroslavl, Rybinsk, Kazan, Gorki, Kuibyshev, Stalingrad and Saratov. These centres have good water transport, electricity and rail-links with the Donbas, Urals and Moscow regions.

There is no doubt that the Soviet industry owes much to the help provided in the past by foreign scientists and engineers. The British firm of Metro-Vickers helped in the electrical industry, as did the German and American engineers and technicians. The famous Molotov automobile



NB 1938 Number of tractors in use = 483.5 thousand

Fig 110 — OUTPUT OF SOVIET-BUILT TRACTORS

plant at Gorki, on the Volga, was designed by the Austin Company of Cleveland, Ohio, which introduced the Russians to mass-production and the conveyor system in 1932. This was the first time that such methods were used in Russia. Another large automobile plant named after Stalin is situated at Moscow. Chelyabinsk, in the Urals, is the home of a great tractor plant designed and laid out by a Detroit firm. Now thousands of tractors, some with caterpillar tracks and running on diesel oil are produced every year from Soviet types designed by Soviet engineers and made by Soviet machines (see Plates 26 and 33). All the world now knows that Stalingrad and Kharkov had tractor plants, as well as Yaroslavl, Chelyabinsk and Leningrad. The war damage is rapidly being repaired and further developments are taking place. At Rostov-on-Don and Omsk, in Central Siberia, new assembly plants have been constructed to make tractors from the parts supplied by the Chelyabinsk factory. It is now quite easy to see why Gorki, Chelyabinsk and Voronezh switched over to aircraft and tank factories in time of war. Irkutsk too has aircraft works, but these are largely based on a large plywood factory situated at the near by town of Baikal.

Combine-harvesters are made near where they are to be used, at Saratov and Rostov. Even Tashkent in Central Asia has its own agricultural machinery works ; and now (since 1932) the Soviet Union is completely independent of foreign countries in the matter of farm implements.

Shipbuilding is to be found at Leningrad where most of the ice-breakers and timber ships are built, at Nikolayev and Sevastopol on the Black Sea, and at Vladivostok on the Pacific coast. Smaller boats are built at Archangel and at Komsomolsk on the Amur, whilst river-boats are constructed at Gorki, Kazan and Molotov (Perm) on the Volga system, and at Kiev on the Dnieper.

The locomotive and wagon-building industry, as in Britain, has grown up at important railway junctions, especially when there is also a supply of iron, semi-finished steel and other metals in the vicinity. One of the largest works is in the Donbas at Lugansk which is able to produce over a thousand locomotives a year. Other railway works are situated at Gorki, Voroshilovgrad, Kolomna, Bryansk, Kalinin, Novocherkassk, near Rostov, and Kharkov, in the west ; at Chelyabinsk, Nizhni-Tagil and Orsk in the Urals ; and at Ulan Ude near Irkutsk, which supplies the eastern end of the T.S.R. Birobjan, the chief town of the Jewish Autonomous region along the Amur, has railway carriage and wagon-building works.

Finally, it will be noticed that the machines used in industries like mining, oil, or milling, are made in the region where they are to be used. For instance Batum makes equipment for the tea industry ; Semipalatinsk has a factory to manufacture equipment for flour milling. Oil-drilling gear is made at Tbilisi (Tiflis) and machinery for the cotton and silk industries at Tashkent.

(d) The Chemical Industries

All the main coalfields now have coke-ovens and by-product plants, which yield many valuable chemicals of the coal-tar group. These chemicals are numerous and range from creosote, explosives, benzine, fertilisers and insecticides to saccharine tablets. Several chemical industries have already been mentioned but two other "ersatz" industries remain—synthetic rubber and plastics. Both industries are interlocked and are closely related to the by-product industries of coal and petroleum.

Synthetic Rubber

Although the Soviet Union has a variety of climates, it is not possible to grow the Brazilian *Hevea* rubber tree. As we have already seen, Soviet scientists tried to find alternative rubber-bearing plants and some of these are now being extensively grown, like the dandelion-like plant Kok-Sagyz

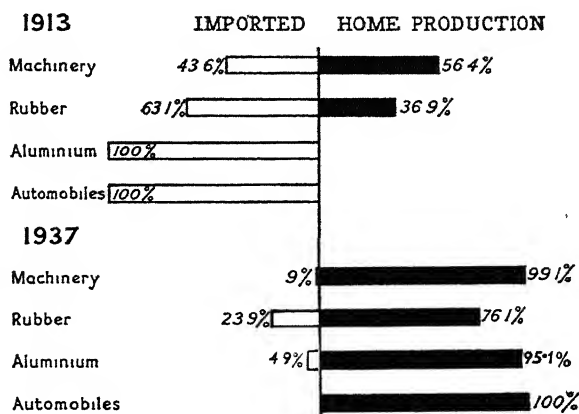
(see p. 162) However, another way in which Russia could make herself independent of imported rubber, of great strategic importance in war-time, was to develop artificial rubber production.

Work on the chemistry of rubber began in the eighteenth century, and Russian chemists have been to the front in these investigations. One of these scientists is called Lebedev, and as a result of his work the first synthetic rubber factory was set up in Leningrad in 1930.

The chemistry of rubber production need not concern us here, but the raw materials which are used are a matter of interest to geographers. The most important raw material is alcohol, and this is largely obtained from potatoes. As a matter of fact, in the early stages of the industry, the

Fig. 111.
THE GROWTH IN
THE ECONOMIC
INDEPENDENCE
OF THE
SOVIET UNION.

1913 shows Russia importing most of the machines, cars and raw materials she used, by 1937 she had reached a large measure of independence and self-sufficiency



alcohol was distilled from cereals. However, it can be seen that this method would soon affect, quite adversely, the food position of the country. To gain some idea of the quantities required—1 acre of potatoes will produce enough alcohol to make about 6 cwts. of rubber. Potatoes too are a most valuable food and so attempts have been made to find another suitable raw material, preferably not a food. One of these is ethylene which can be obtained from petroleum by the "cracking process." In the U.S.A. and Germany, the raw material most largely used is acetylene. This can be produced in commercial quantities both from oil wastes and from calcium carbide. Incidentally, the Soviet scientist Favorsky is also working on this approach, and the first tyres from this kind of rubber were actually made in 1940. To manufacture calcium carbide, the chemical industry only requires coal-dust, limestone and cheap electricity, and so this side of the industry can develop with speed in the U.S.S.R.

There are now at least three types of synthetic rubber, one is called *sovprene*, and the others are called *Ska* and *Skb*, which are similar to the

American and German types (*Buna*). It must not be thought that these types are identical in properties to natural rubber. In some respects they are better, in others they are not so good

The largest synthetic rubber plant is at Erivan in Armenia, which is near the petroleum deposits of the Caucasus and hydro-electric stations. Other plants are situated at Kazan, Tambov, Efremov, Magnitogorsk and Cheremkhovo near Irkutsk, in the Far East, where coal, lime and rock-salt are found. There are other plants at Voronezh in the potato-growing region and at Aktyubinsk in Kazakhstan near the Ural-Emba oilfield (see p. 206)

The production of acetylene and ethylene, used in rubber production, also serves as the raw materials for the new and important plastics-industry, in addition to helping the manufacture of acetic acid and acetone which are essential in the manufacture of artificial silk.

Table 6

SYNTHETIC RUBBER

1932	375 tons
1933	2,370 tons
1934 . . .	11,000 tons
1935	20,000 tons

Plastics. This is a new word which has come into current use within the last few years, and war-time experiment has shown the importance of plastics. A Plastics Trust was set up in the Soviet Union in 1937 and these new substances, which can be moulded into aircraft wings, wireless cabinets and splinterless glass, like "perspex," have rapidly been developed. In fact, light alloys like the aluminium alloys, are being replaced in some respects by plastics.

There is one group of plastics, like "Bakelite," which is extensively used for electrical fittings. This is obtained from such coal by-products as formalin, carbolic acid and ammonia. These are mixed with sawdust and the resulting resinous substance can be moulded into any shape by the application of heat and pressure.

Another group of plastics depends on the acetylene from the calcium carbide industry; or from the petroleum by-product, ethylene. These plastics are used for the artificial glass in aircraft windows, or for cockpit covers and turrets.

Most people know of the triumph of the wooden "Mosquito" aircraft during the Second World War. The Russians, too, had experimented with the manufacture of training-aircraft and gliders from ordinary plywood for many years; now they are made from plastic plywood. As a matter

of fact, it was from the Russians that the Nazis learnt the art of glider-towing and parachute-jumping in mass formation. Plywood consists of thin veneers of wood, mainly birch, which are placed on top of each other, with the grain of alternate veneers at right angles. These sheets have then to be stuck together and it is in the choice of a glue that the plastic industry is concerned. Thus it is seen that the timber and chemical industries are closely related.

Synthetic resin-glues now allow plywood to withstand great stresses and hard wear. In some cases the resin bond is actually stronger than the wood. With some of the new processes heat is applied to the plywood veneers and their plastic resins by electrical methods, and when pressure is also applied the wood can be moulded into any shape. Another important thing is that these laminated plywoods are able to withstand all weathers and are unaffected by moisture.

Several cellulose and plastic works have grown up in the Soviet Union. These are found at Byeloretsk in the Urals, north-west of Magnitogorsk, and at the chemical industry centre of Berezniki in the Upper Kama valley. Both are in the Coniferous Forest Belt, and it is not surprising to find the plywood factory at Baikal, close to the Irkutsk aircraft factory.

Apart from war-time "shadow" factories, the main aero-engine works were at Magnitogorsk, Ufa, Chelyabinsk in the Urals and at Gorki on the Volga. The chief aircraft factories were at Moscow, Leningrad, Kiev and Kharkov in the west; Voronezh and Gorki farther east; with Tomsk and Irkutsk still farther away eastwards. In almost all cases they are near raw materials—steel, alloys, aluminium and timber, as well as having a supply of skilled labour. The majority of the workers were women even before 1941.

(e) *The Timber Industry.*

The Soviet Union possesses about one-third of the timber resources of the world, covering 2,500 million acres, i.e. equivalent to about a third of Africa. These trees are mainly "soft-woods." This term means that they are used in construction. It is a misnomer, for some of them are harder than the "hard-woods," for it may be interesting to note that *balsa wood* is grouped with the latter. The U.S.S.R. is most fortunate, because the amount of timber felled each year is only about half the amount which has been added by one year's growth. Thus the reserves of timber continue to increase, and the forests are not being depleted as in so many other timber-producing countries.

Sawmills have been built in the northern forest belt, and a great deal of money has been spent in modernising the mills and introducing machines for felling and handling the timber. There are electrically driven motor-waggons, and special track-laying machines for constructing the wide-gauge timber-carrying railways. At the ports, there are floating cranes and piling



Plate 52 —TIMBER RAFTING IN THE FAR EAST

The Siberian Taiga is a vast timber-producing region as yet almost untouched. This Russian lumber-jack is nimbly freeing a jam of logs.

elevators In 1936 alone, there were over 3000 tractors in use, and new roads have been constructed through the forests. Wherever possible, rivers are used for the floating of the logs, and as many of the mills as possible are situated along the river banks.

As would be expected, the most highly developed timber areas are those in the north-west. However, many sawmills are being and have been built in the former virgin tracts of Siberia and the Far East, e.g. in Sakhalin and the Upper Zeya and Ussuri, and at Soviet Harbour on the Pacific coast.

Not only are sawmills to be found in the Coniferous Forest Region, but also wood-chemical combines have been established at Archangel and Vologda. Some plants just grind the timber, and this "groundwood" is made into newsprint and the poorer types of wallpaper or board. When wood-pulp is desired, the timber is treated chemically, and a pulp of pure cellulose remains. This is used in the manufacture of good-quality paper. To make this, the cellulose is rolled into sheets and then the pore-spaces are "filled" with substances like china-clay or barytes (barium sulphate). A considerable amount of paper is produced in the Leningrad region—at Segezha on the Baltic-White Sea canal; at Vologda to the east; and at

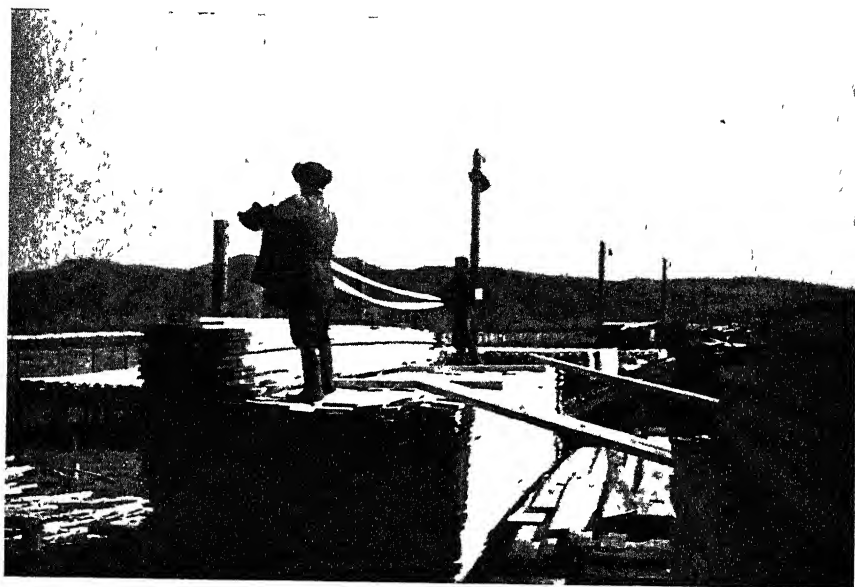


Plate 53—A TIMBER MILL IN THE FAR EAST

This shows the cut planks being piled up in order to season

Kondopoga in Karelia. Other paper-mills are situated in the Urals and in White Russia.

Many other substances can be made from cellulose, apart from paper. Perhaps the most important is artificial silk, or rayon. To make this, the chemically treated pulp is hardened by acetic acid and it can then be drawn into fine threads which can later be woven into fabrics. Cellophane, artificial leather, gramophone records, paints and varnishes, and even sausage-skins, are derivatives of cellulose.

A considerable amount of timber is used for construction purposes. The sawmills prepare doors and window-frames, prefabricated houses, or veneers of plywood. In all the regions adjoining the forest, timber is the chief material for house-building. It must be realised that after a log has been stripped of its bark, squared, seasoned, and cut into quarters, or into planks, about 60 per cent. of the wood becomes "waste." However, much of this, even the sawdust, can be used to produce pulp and cellulose.

Russia has always been a great exporter of timber, and much of it has found a market in Britain. In 1936 about 40 per cent. came to Britain, for we are great timber-users and form the natural customer of the U.S.S.R.

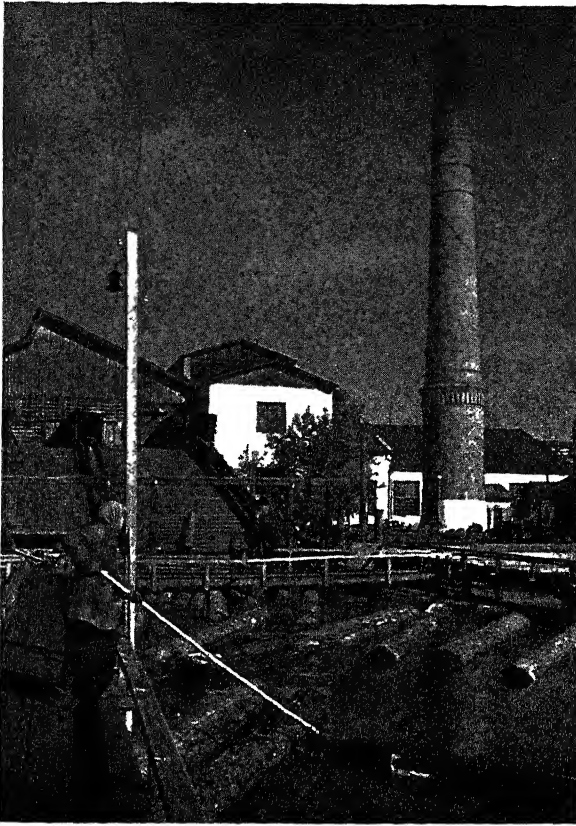


Plate 54
SAWMILL,
MINUSSINSK PLATEAU
IN THE UPPER
YENISEI VALLEY

Notice that female labour is being employed in this quite heavy industry. This is typical of the U.S.S.R., where there is so much work to be done. She is keeping the logs moving into the mill.

Leningrad is one of the world's most up-to-date ports for handling timber. A high degree of mechanisation is necessary, for the work has to be concentrated into the short, ice-free summer season. Another important port is Archangel on the White Sea. This actually suffers from the winter freeze-up more than Leningrad. It is here that the largest sawmill, containing twenty-four frames, is situated. The frame-saw can cut a log into several planks of desired thickness in one operation.

Wood is made into innumerable articles, some is used by the heavy industries, and even to-day much timber is employed in all branches of shipbuilding. Therefore, the timber industry is linked to the other basic industries of the Soviet Union. However, another large quota of wood is converted into paper, silk stockings, bobbins, matches and furniture; and



Plate 55 —THE HARBOUR, ARCHANGEL

Although it is frozen for about 190 days every year it had a population of 281,000 in 1939. Archangel is a great timber port, having sawmills and plywood factories as well as paper-making, textiles and shipbuilding. It is actually 20 miles from the mouth of the Dvina and is situated where the river narrows. The Vologda railway links it with Moscow and the river is navigable to Kotlas for large boats.

so the timber industry is linked with the next group of industries, those which produce consumers' goods.

THE INDUSTRIES WHICH PRODUCE ARTICLES TO USE

Before the introduction of the Five Year Plans, the industries which produced articles to use were but poorly developed, and showed the same tendency as heavy industry in being situated in the west. These industries produce consumers' goods, including the food, drink and clothing industries as well as those manufacturing furniture, typewriters, cameras and wireless sets. Such articles are bought and sold in shops, in contrast with the other goods we have previously considered.

It is not possible, or necessary here, to describe all the factories which now manufacture and process food. What is noticeable is their new distribution.

There is a tendency now for food to be tinned or canned, or refined near the place where it is grown, or obtained. A map showing the distribution of factories like sugar-refineries, meat-packing combines and fish-canneries, is notable for its even distribution throughout the Soviet Union. It would almost show the same distribution as the arable land, and the denser areas of settlement (Figs 66 and 130)

(a) *The Food Industry*

(1) *Meat*

The meat combines are now large, modern factories very similar to the meat-packing centres of the Middle-West in U.S.A. They are to be found in the cattle- and sheep-producing areas. The animals are killed in hygienic abattoirs by scientific methods, and the carcasses are treated to produce tinned meat-products, pastes, or chilled joints of meat. If transport is necessary, this is done in refrigerator cars. As in other countries there are important by-product industries associated with the food industry. From these, glue, leather, brushes, buttons and valuable fertilisers are produced. Meat-packing combines are to be found in Moscow, Leningrad and Kharkov in the west; whilst Sverdlovsk, in the Urals, has a factory with refrigerator plant and sausage department capable of dealing with 500 cattle and 4000 smaller animals per day. Semipalatinsk and Irkutsk serve the centre of the country and the East. The factory at Irkutsk makes about 45 tons of sausages every day. In the Far East there are meat-packing stations at Ulan Ude and Kharbarovsk.

(11) *Fish*

The days when the Russian peasant relied on salted herrings, from Yarmouth or Lowestoft, as his luxury are now over. The Soviet Union has its own well-organised fishing industry. Murmansk, a former importer of fish, is the centre for the Arctic fisheries. It is in the Barents Sea that Russian fishermen meet those from Scottish and English ports. In the Far East there are now forty-five canneries at Vladivostok and Soviet Harbour, and others on Kamchatka and Sakhalin. The rivers of the

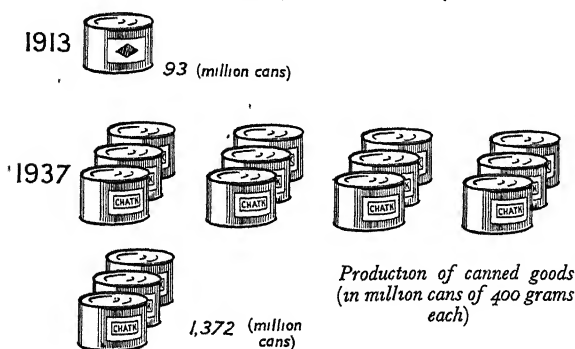


Fig 112.—EXPANSION OF THE FOOD-CANNING INDUSTRY.

Far East teem with salmon (see Plate 56). The people rely on fish as their staple diet, and three canneries, employing more than 2000 people, have been built at Nizhni-Kamchatsk. Seals and whales are to be found in the Arctic and North Pacific waters and the fishermen operate with large factory-ships which can cut up the whale and extract the oil while at sea (see Plate 57). In 1940, the fleet of whaling vessels operated for the first time without foreign harpooners, and in 1942 averaged seven whales a day. Whale meat is canned, and adds to the nation's food reserves.

A considerable weight of fish is obtained from inland lakes, seas and rivers. The sturgeon, a large fish like a pike, is well known to every one. This comes from the Volga and the large Siberian rivers. As a matter of fact, nearly half the river fish of Russia comes from the Volga ; and Astrakhan, the port at the delta of the Volga, deals with the river vessels fishing upstream as far as Stalingrad, in addition to those operating in the Caspian Sea. Salt is obtained from the dried-up lakes, like Lake Elton to the north east ; and Astrakhan has canneries and refrigerator plants. It is from the female sturgeon that the delicacy called *caviare* is obtained.

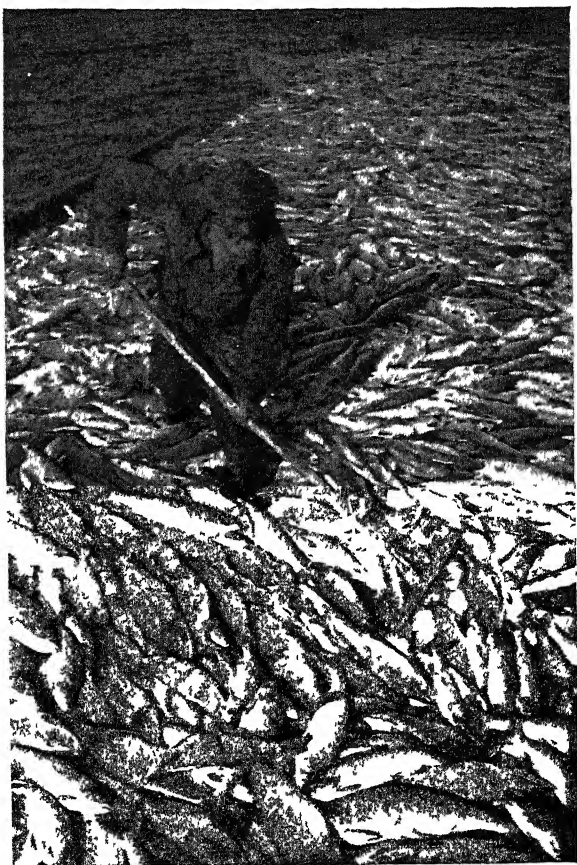


Plate 56 — SALMON-FISHING

The seas, lakes and rivers of Russia are rich in many kinds of fish. A network of canneries is growing up in all parts, especially the Far East. This shows the teeming salmon on the shores of Kamchatka.

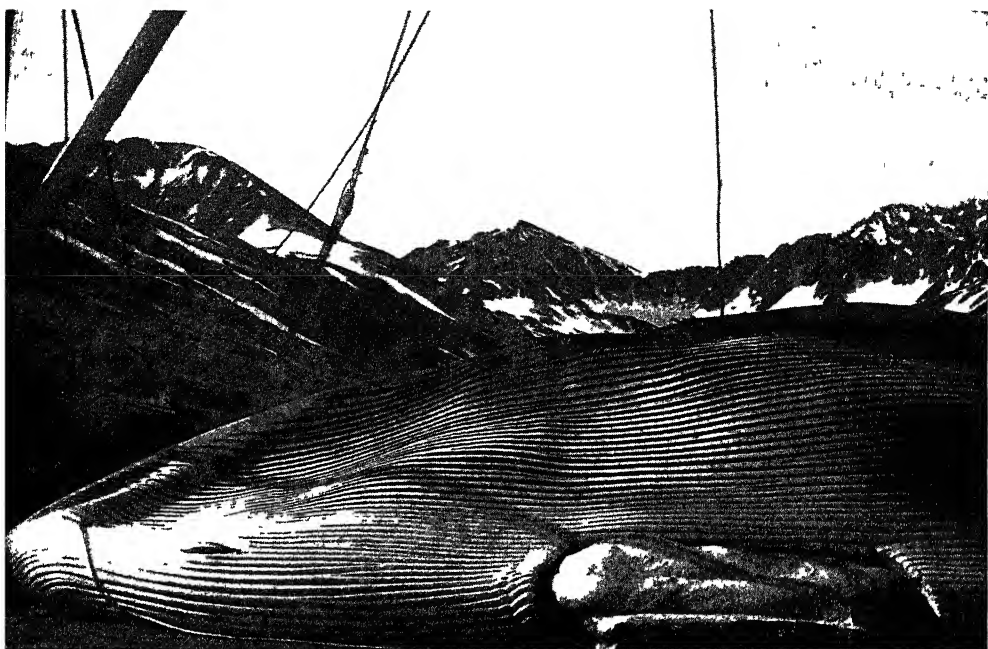


Plate 57 —A HARPOONED WHALE

The Far Eastern whaling fleet based on Petropavlovsk, Kamchatka, is now most of a whale very well. It must have been caught towards the end of

This kind of fish-roe, purple or white, is in great demand in the Soviet Union. Fish-canning is now carried on at Moscow, Kiev and Dnepropetrovsk, and along the shores of Lake Baikal. Here, another important source of fish has recently been found.

The industry is organised on a co-operative basis, and breeding-tanks for maintaining the stock in the rivers and lakes are found at Moscow, Leningrad and Astrakhan. To give some idea of the size of the industry the total catch in 1936 was 17 million tons: 25 per cent came from the Far East and 30 per cent from the Caspian sea. This easily exceeds that of Britain, which only reached 7 million tons in 1931.

(iii) *Sugar*

The increased acreage under sugar-beet has been noted (p. 179), and the sugar-beet factories are now no longer restricted to the Kiev and Kursk regions. New refineries have been erected in Central Asia at Yelan, Kolenov, Jerdevka near Alma-Ata and Ferghana, as well as in the Far East, where a factory was built under the Second Five Year Plan, at Voroshilov, near



ON THE DECK OF A WHALER.

important Factory-ships deal with the whales at sea. The photograph shows the size of the trip as it is still on deck. Notice the barren tundra background.

Vladivostok Before 1941, there were over 200 refineries in the Soviet Union which processed at least 2.5 million tons of sugar, both the granulated and lump varieties.

(iv) *Other Foods*

It is now clear that all regions in the Soviet Union are attempting to satisfy their own food requirements. This fact also applies to the Arctic regions. Milling was formerly carried out by small wind- and water-mills; now, highly mechanised flourmills are to be found in all the large cereal-producing areas and in all large towns. Most cities are equipped with mechanised bakeries which produce thousands of loaves and cakes every day. The Far East supplies its own needs, and a plant for extracting soya-bean oil has been built at Voroshilov; whilst there is a confectionery and macaroni factory at Kharbarovsk.

At Batum and Erivan, in the Caucasus region, as well as in Central Asia, the canning of fruit, especially apricots, peaches and cherries, has developed. Of course, these are in the chief fruit-growing areas.

Further, milk is processed and dried at factories in the dairy-farming regions, as at Kalinin, Omsk, Odessa, and at Meleuzovsky in the western foothills of the Urals. Cheese factories too are developing. There is a large one at Uglich, on the Volga.

(b) *The Drink Industry*

Whenever a foreigner thinks of drink in connection with Russia, his mind flashes to the word "vodka." This is a clear alcoholic drink obtained by distilling rye, or even barley or potatoes. It was customary for the poor, hard-worked Russian peasant to drown his sorrows in vodka, but now very little is actually drunk in the U.S.S.R. Its place has been taken by the Soviet wine-industry, for now quite palatable Soviet champagne and Soviet tokay are produced. Another popular drink is "Narzan," an aerated spa-water which comes from the health resort of Kislovodsk in the North Caucasus, a little to the south of Pyatigorsk. Most large towns have kiosks where this and other soft-fruit drinks are sold during the warm summer months.

(c) *The Textile and Clothing Industries*

(i) *The Cotton Industry*

In Tsarist Russia 95 per cent of all the spindles and looms for the cotton industry were to be found in the Leningrad, Moscow and Ivanovo regions ;

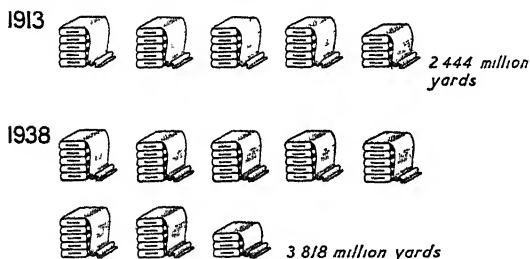


Fig 113.—INCREASED OUTPUT OF COTTON FABRICS.

Each roll of cloth represents about 100 million yards of cotton fabric.

some of these had grown into quite large factories out of the smaller handicraft industries. However, it was most one-sided, dependent on foreign capital, and no raw cotton was grown within thousands of miles. The position was that the raw material came by indifferent means of transport 2000 miles from Central Asia to Moscow where it was spun and

woven into cloth. Then, if the people of Central Asia could afford to pay for the finished articles, these had to be sent back over the 2000 miles. Little wonder is it that the people of Central Asia were surrounded by fields of raw cotton and yet were unable to buy a cotton shirt !

This most uneconomic arrangement is slowly being altered. Central Asia now has its own textile mills, to spin and weave the raw cotton ; in addition to clothing-mills where the bales of cotton cloth are printed and



Plate 58.—THE STALIN TEXTILE MILLS, TASHKENT, IN UZBEKISTAN.

No longer is all the raw cotton sent from Central Asia, for many of the old-world towns now have modern factories like this one. In 1939 Tashkent was the eighth town of the Soviet Union, with a population of 585,000.

made up into garments for the people of these formerly backward republics. Now, at least 5 per cent. of the fabrics are produced by modern mills, such as the Stalin Cotton Combine at Tashkent, and others at Kokand, Ferghana, Ashkhabad, Khojent and Stalinabad. Thus the geographical principle whereby industry moves to the base of the raw material, is being worked out according to a plan. In the cotton-growing areas of Transcaucasia, more textile mills have been constructed at Leninakan, Ganje, Baku and Kirovobad. Even the Ukraine cotton-area has its weaving-mills at Poltava. Barnaul, to the west of the Kuzbas, provides an example of a town which has a textile combine but no local cotton-growing. However, the factory is near to the market for the finished article. The raw cotton can be brought from Central Asia as a return freight and sent on the goods trains which have brought Siberian timber and cereals southwards. The line through Barnaul links Central Asia with the T.S.R. at Novosibirsk.

Although there has been some dispersion of the cotton industry, the Moscow and Ivanovo provinces still account for about 80 per cent. of the spinning and weaving of cotton fabrics. This town of Ivanovo, to the north-east of Moscow, is usually referred to as the "Manchester of the U.S.S.R."



Plate 59 —DZERZHINSKY TEXTILE MILLS, IVANOVO REGION, NEAR MOSCOW. This region has been important for the textile industries (flax, cotton, wool) since the late nineteenth century. It still remains at such centres as Ivanovo, Gorki and Yaroslavl.

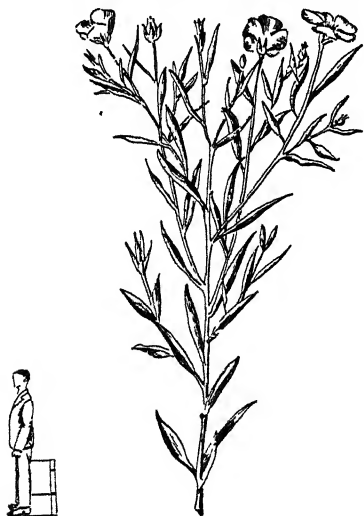


Fig. 114.—FLAX
(*Linum usitatissimum*)

The U.S.S.R. grows more flax than any other country in the world. It requires a cool, moist summer and is grown on the podsol soils of the forest region from White Russia to Moscow and the Kama Valley. Lately it has been extended into Siberia, near Omsk and Barnaul. Its fibre is made into linen and its seeds yield linseed oil.

It is an important textile centre but neither its population nor its built-up areas are as large as Manchester's. Ivanovo had a population of about 285,000 in 1939, whilst Manchester has a population of over a million with "Greater Manchester" having about 2½ million people. Another difference is that the Ivanovo-Moscow cotton-manufacturing region includes the linen industry close by.

(11) *Linen Industry*

The region lying north and north-west of Moscow, especially in the area on either side of the Volga, still remains the most important flax-growing area and hence it has become a region specialising in linen manufacture. Three-quarters of the linen cloth is produced by the factories in the Ivanovo region. Large new factories (Plate 59) have been built at Rzhev, Kalinin, Bezhetsk and Yaroslavl; many of the places which figured in the news from the Moscow front in 1941-1942

Just as the raw cotton has to be cleaned of its seeds by the ginning process, so flax stalks have to be treated before the fibres can be spun into linen yarn. After the flax plant has been pulled up, it is made into bundles. These are then "retted," that is, they are placed in water, in ponds, lakes

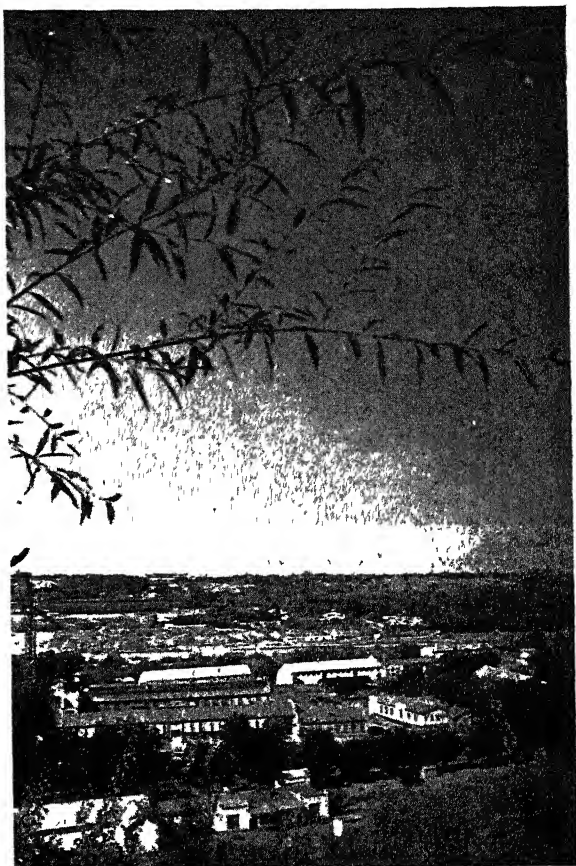


Plate 60.—A SILK FACTORY, OSH (KIRGHIZIA)

It is said that Adam settled in Osh and brought ten silkworms which founded the industry. He did not, however, build the modern silk-mills. This town used to be the Mecca of Turkistan and pilgrims came to visit the sacred mountain. Osh is situated on the southern slopes of the Ferghana Valley.

or tanks, and allowed to ferment. The fleshy part of the stalk is removed by this process, leaving behind the fibres and woody part. Rolling breaks the fibres from the woody tissues, and the process of "heckling" combs the stalks separating the long fibres from the shorter "tow." Previously this separation was done by hand and consisted of drawing the stalks through steel teeth, or nails, placed upright on a piece of wood. Now machines do the work.

The other important linen mills are to be found in the new flax-growing districts. These are at Orsha in White Russia and Smolensk, both along the Upper Dnieper. Then, in the Urals, linen mills are found at Sverdlovsk. Siberia too has some new factories at Buzsk and Barnaul, both close to the Kuzbas.

(iii) Woollen Industry

One of the largest factories in Europe for knitted goods is at Leningrad, but there are others in the Moscow districts. This precise location is a legacy of the past. Now there is the tendency for the woollen industry to

move to the wool-producing areas of the Caucasus region, where factories have been built at Tbilisi (Tiflis) and Erivan. The stocklands of Kazakhstan, which in 1939 produced 8000 tons of wool, no longer send it away; local textile mills use it. Alma Ata, Chimkent and Tashkent all have woollen mills and clothing factories, as well as their cotton mills.

A branch of the woollen industry is carpet-weaving. Every one knows that Turkmenian carpets are famous all over the world. Previously it was a domestic industry, but now the weavers work in hand-weaving co-operatives. The dye-yielding plants are grown on a large scale and a State Carpet Warehouse for these most delicate and brightly coloured works of art is situated at Ashkhabad.

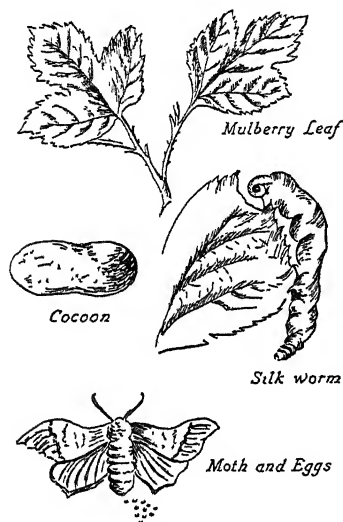


Fig. 115 —SERICULTURE

The real silk industry is chiefly centred in Central Asia, particularly Uzbekistan. The silkworms are fed on mulberry leaves. It is no longer a domestic industry for there are large silkworm "farms" and big silk plants at Margelan, Samarkand and Bokhara. Experiments are now being carried on at Gorki to breed silkworms which will feed on birch leaves.

(iv) The Silk Industry.

Sericulture, or the rearing of silkworms, occurs in Central Asia and Transcaucasia. The silkworms are fed on mulberry leaves, and after the worm has spun its cocoon and turned into a chrysalis, the former is placed in an oven; this kills the pupating insect which would otherwise emerge as

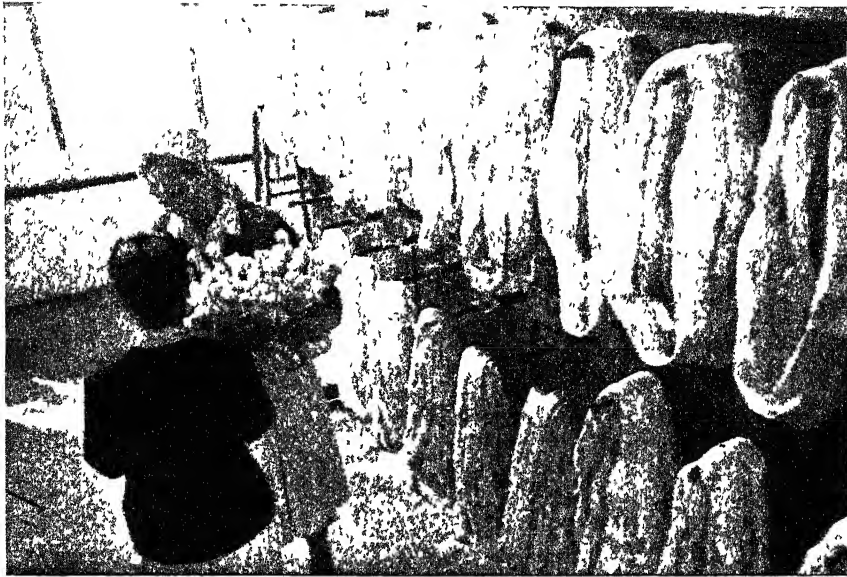


Plate 6r.—INSIDE A SILK FACTORY AT OSH, KIRGHIZIA.

The silk is spun from each cocoon into large skeins and then woven. The industry is found especially in Central Asia.

a moth and spoil the continuity of the silky thread. The cocoons were previously spun by women in their own homes and much of this spun-silk was manufactured into silk fabrics at Moscow. Now, the silk industry provides one further example of an industry which is tending to move to the raw material. New factories have recently been built in Central Asia, at Osh, Leninabad, Stalinabad, Kokand and Tashkent. The other important region engaged in sericulture is Caucasia where silk-spinning and weaving are to be found at Tbilisi (Tiflis) and Kutaisi in the republic of Georgia.

(v) *The Boot and Shoe Industry.*

The leather and footwear industry was but feebly developed before the Revolution when there was only one shoe factory at St. Petersburg. It was called Skorokhod. The Russian peasant was poorly shod, relying on rags or felt around his feet, or even the woody fibre called bast. The situation is now very different; there are large boot and shoe factories in Leningrad, Moscow and near the new cattle-rearing areas at Sverdlovsk, Tashkent, Tbilisi and many other towns in Central Asia and the Far East. Factories in Tadzhikistan produce a kind of tennis shoe with white cloth upper-parts and synthetic rubber soles. These shoes are most popular for summer wear, and can be seen worn in most towns and villages of the Soviet Union.



Plate 62 —A TRAPPER WITH HIS CATCH

Trapping is no longer an haphazard occupation, modern traps and weapons are used and extermination of species is avoided by careful planning. This trapper has caught a blue fox. Notice he wears dark goggles to prevent his eyes from being damaged by the glare from the snow.

(vi) *Furs*

Russia has always been noted for its furs, and trapping was formerly the chief occupation and source of income for the people of the Tundra and northern forests. It was customary for the Russian traders to barter valuable furs from the nomadic Asiatic tribesmen for a bottle of vodka, a knife, or in later times, some ammunition. The chief animals which are hunted and trapped are the sable, marten, lemming, Arctic fox and hare. This is no longer a "robber" industry with no thought of the possible extermination of the animals. There are special breeding stations, and trapping stations, where the hunters can bring their furs, and live under more civilised and cultured conditions. The application of scientific trapping is taught to these formerly illiterate nomads.

Every year an International Fur Auction is held at Leningrad in normal times. In 1936 the sales realised £570,000 and most of the buyers were British or American. Now more and more furs remain in the Soviet Union, where a fur coat is bought for use rather than for fashion.

(d) *The Light Industry*

Light industry has expanded in the west, and has been established in the Caucasus, Central Asia and Siberia for the first time. Such industries as furniture-making are usually found in the forested areas, as at Leningrad in the west, Birobijan in the east and Tbilisi (Tiflis) in the Caucasus. Tobacco factories have been established in the Caucasus where the Turkish tobacco is grown. The Northern Ukraine grows a coarser type called "makhorka." Factories have now been built at Kharkov and Odessa.

There has always been a scarcity of such consumers' goods as gramophones, radio-sets, typewriters, cameras and cars. Many thousands have been produced, but they have been sent chiefly to people and departments with "priority" claim. The surplus has been quickly snapped up. The point is: that Russia concentrated on capital goods under the first two Five Year Plans and more factories were to produce these semi-luxury consumers' goods under the third Five Year Plan. It so happened, however, that factories were too busy making clothing, and equipping the Red Army, or building bridges and blast-furnaces, to concentrate on fancy dresses, cameras and vacuum-cleaners. This is precisely the situation found in a country like Britain during war time.

SUMMARY

It must not be thought that industries are scattered haphazardly throughout the Soviet Union. In modern, highly developed countries, the industrial areas take on the appearance of a complicated, inter-connected assembly of different processes. By sketching, in tabulated form, the interrelation of power to raw material, of semi-finished goods to finishing processes, we shall see how the "industrial giants" of the Soviet Union are able to develop their momentum. The areas listed below are really great industrial "combines" or "complexes" where all the various processes are amalgamated in adjacent factories and industrial towns.

(a) *Donbas*

Coal →	Heat, thermal electricity, coke, gas, chemicals (by-products).
Iron from Krivoi Rog + coke →	Blast-furnaces and pig-iron at Makayevka and Stalino.
Coke from Donbas + Iron-ore from Krivoi Rog →	Blast-furnaces at Krivoi Rog and Zaporozhe.
Bauxite from Urals or Tikhvin + hydro-electricity on Dnieper →	Aluminium
Hydro-electricity at Zaporozhe + pig-iron + tungsten →	Special steels.
Pig-iron + scrap iron →	Steel furnaces at Stalino.

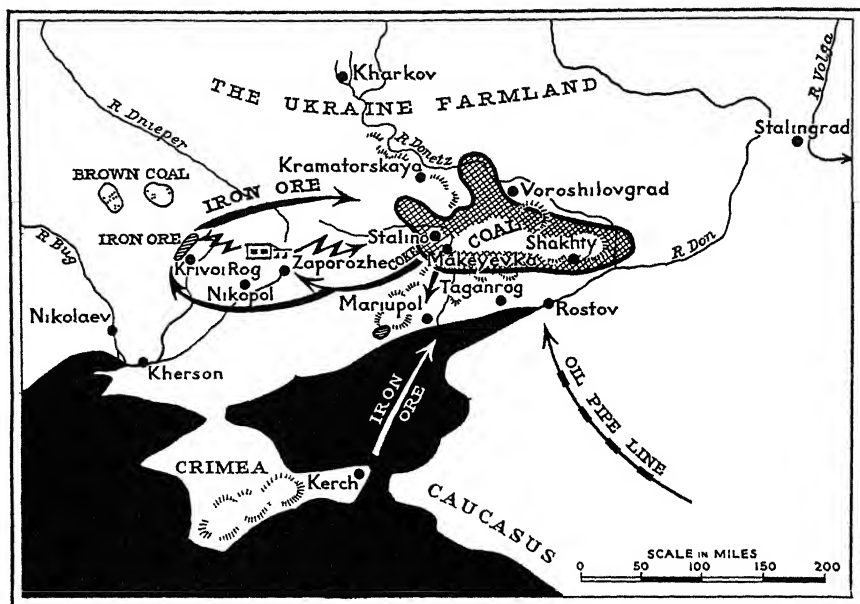


Fig. 116—SKETCH-MAP OF THE DONETZ BASIN, OR DONBAS

Semi-finished steel + labour power	→	Engineering works at Makeyevka.
Petroleum from Baku (cracking process)	→	Petroleum by-products (synthetic rubber, plastics)
Coke-oven gas	→	Heat for Siemen's open-hearth furnaces

(b) *Urals-Kuznetsk Combine (U.K.C.)*

(See Fig. 105.)

Magnetite iron-ore near Magnitogorsk + coke from Kuzbas →

Blast-furnaces at Nizhni-Tagil and Magnitogorsk

Kuzbas coke + magnetite ore from Urals →

Blast-furnaces at Stalinsk in the Kuzbas

Nickel, chromium, cobalt in Urals + pig-iron →

Special steels at Sverdlovsk and Zlatoust

Open-hearth steels + special steels →

Engineering and machine-tool industry at Sverdlovsk

Semi-finished steel + timber + rubber →

Automobile and aero-engine works at Miass, Chelyabinsk and Magnitogorsk.

Potash and other salts at Solikamsk →

Chemical industry at Berezniki.

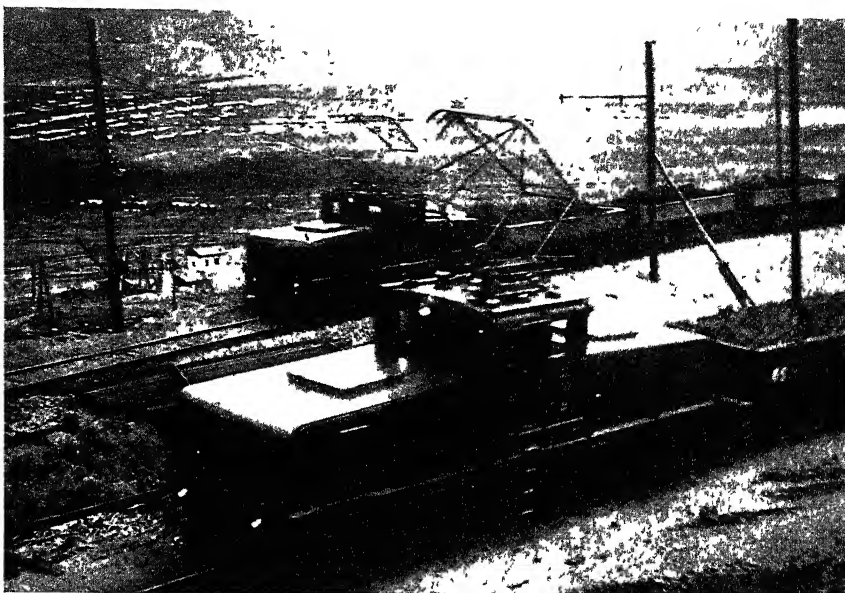


Plate 63 —THE HAULAGE OF ORE AND COKE FROM KUZNETSK TO
MAGNITOGORSK IN THE URALS

More and more railway lines are being built, especially in the highly industrialised regions and in the larger cities

(c) *Moscow Region*

Peat + brown coal of Tula basin →	Thermal electricity
Iron-ore from Kursk + pig-iron from Donbas →	Steel furnaces near Moscow.
Special steels →	Ball-bearing plant and machine-tool industry.
Local flax + electric power →	Textile industries of Ivanovo
Leather and hides from local farms	Boot and shoe industry.
Local cattle, pigs and sheep →	Meat-packing industry
Semi-finished steel + timber + rubber + labour →	Stalin motor works.

(d) *Caucasus*

Petroleum of Baku and Grozny (refineries) →	Petrol and by-products.
Petroleum by-products →	Synthetic rubber industry at Erivan.
Coal from Tkvarcheli and Tkivbuli →	Coke and gas.

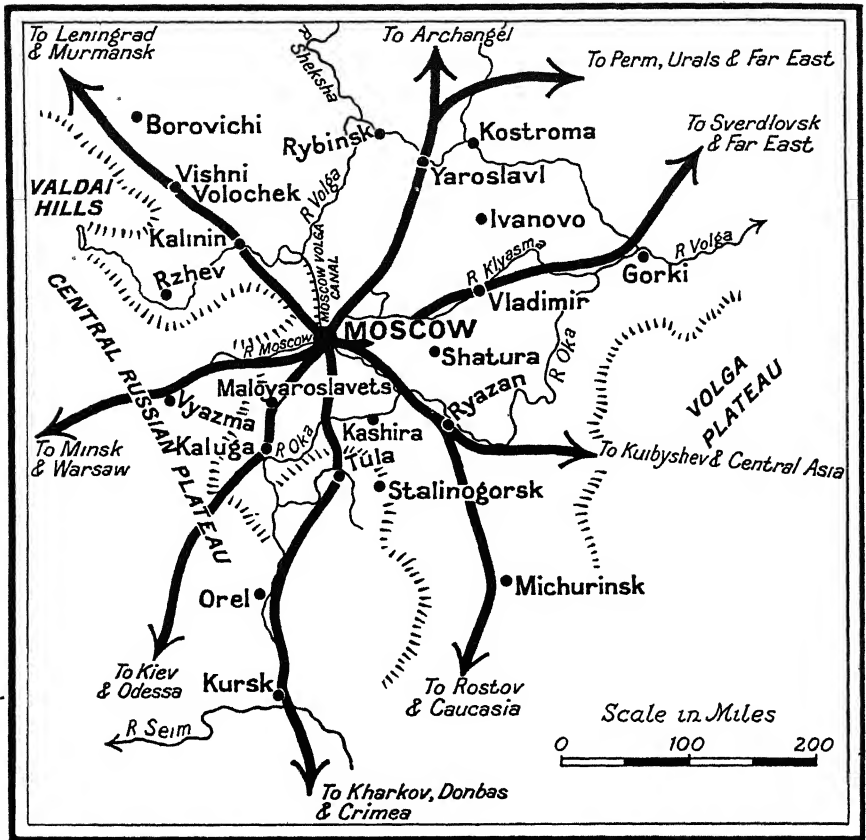


Fig. 117.—SKETCH-MAP OF THE MOSCOW REGION.

Moscow is situated in a "Mesopotamian" region between the Rivers Oka and Volga. Notice its nodal position regarding the water and railway systems of transport.

Coal + limestone →	Calcium carbide. Synthetic rubber
Coal, gas, electricity + manganese ore →	Manganese at Allahverd.
Iron-ore at Dashkezan + coke →	Iron and steel at Tbilisi.
Iron and steel →	Engineering works at Tbilisi.
Copper ore from Dashkezan and Zangezur + coal →	Copper and brass
Hydro-electric power on Rion, Zanga and Kura →	Textile industry (local silk and cotton and wool) at Leninakan, Kirovabad and Baku.

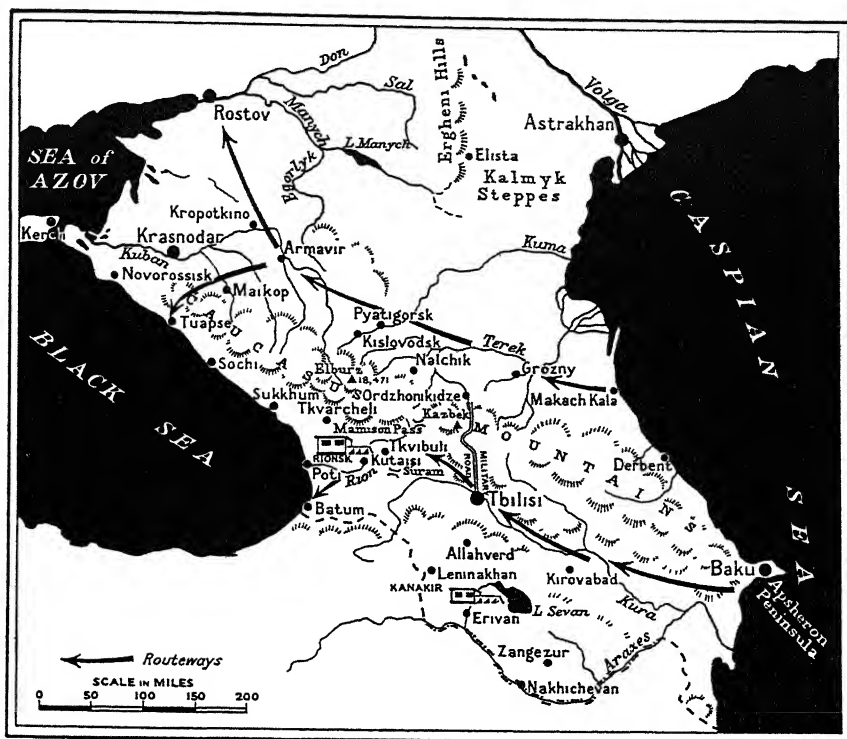


Fig 118.—SKETCH-MAP OF THE CAUCASUS REGION.

The rather isolated region of Transcaucasia is noticeable in the Kura River valley. The hydro-electric power development in this region is important.

(e) *Central Asia.* (See Fig. 107.)

Coalmines at Karaganda →	Coke, gas and coal by-products.
Copper ore at Kounrad + coke + gas →	Copper and sulphuric acid.
Phosphates at Aktyubinsk + salt from Lake Balkash →	Chemical industry.
Hydro-electricity at Chirchik and Vakhsh + local cotton →	Textiles at Tashkent.
Hydro-electricity + local silk →	Silk textile industry at Osh, Leninabad and Tashkent.
Copper of Almalyk + mercury + tin →	Non-ferrous metallurgy.
Hydro-electricity + air + water →	Nitrogenous fertilisers.

CHAPTER IX

TRANSPORT

TRANSPORT has always been one of the major problems in Russia. This is primarily due to the vastness of the territory. By 1913 a considerable network of railways had grown up in European Russia, while Asia was dependent on just two straggling arteries. Russia's rail-net was very open, when compared with that of the North American continent; or even when the network of the Ukraine is compared with that in the farmlands of the Middle-West. Even in 1940 U.S.A. had about 20 miles of railroad for every 10,000 people, while the Soviet Union had about 3 miles per 10,000 people. It would be expected that in a region of long slow-flowing rivers, water-transport would be considerable. Fig. 119 shows the short portages separating the different drainage areas, and the great length of navigable waterways which is of the order of 250,000 miles. The waterways have been used from the days of the Vikings and before (p. 102); but since they are frozen for varying parts of the year, and the long Siberian rivers flow into the Arctic, the rivers have not been developed as much as would have been expected. In fact, since the beginning of the Railway Era, a hundred years ago, the railways have taken the bulk of the traffic and thereby prevented the development of both roads and waterways.

Since 1928 there has been a period of rapid expansion in both the means of transport and the tonnage carried, and it will be necessary to compare the present network with that which the Soviet government inherited from the Tsarist period. Even after 1917 the position did not improve, for the Civil War and Intervention destroyed over 4000 bridges and 1250 miles of track. The 1913-position was not re-established until 1926, and so it is against this background that the present should be assessed. By this standard the development of twenty years, as reflected in the present transport network, is truly remarkable.

I WATERWAYS AND WATER TRANSPORT

The U.S.S.R. is one of the foremost countries in the world for the length of its navigable¹ inland waterways. This has been computed to be 248,400 miles, and even in 1939 only about a quarter of these waterways were being used for navigation. However, this figure of 65,826 miles is more than double the length of waterways used in 1913, which was only 27,945 miles.

¹ "Navigable" means that the depth is sufficient for river-boats worked with mechanical power, and with flash-signalling apparatus and buoys always in operation.

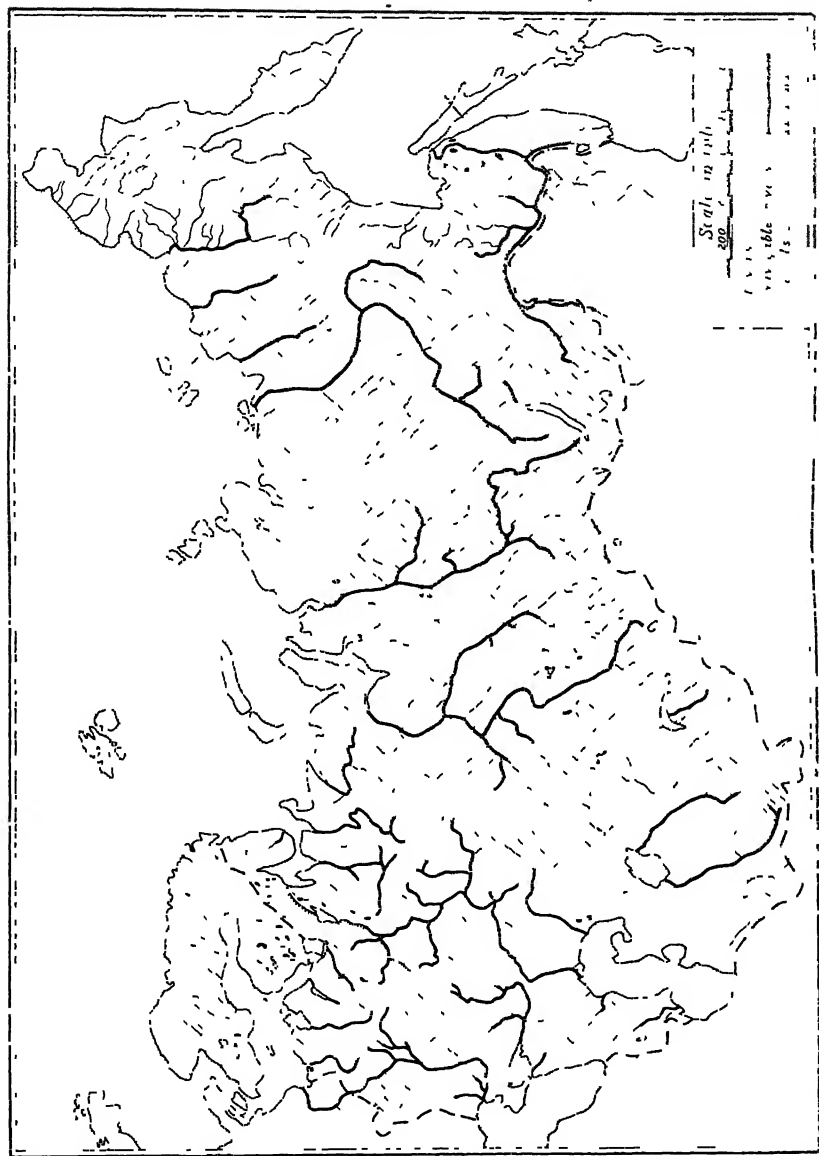


Fig. 119.—THE RIVER PATTERN AND THE NAVIGABLE WATERWAYS OF THE SOVIET UNION.

This map shows most clearly that Western Russia has a radial pattern of rivers whilst in Siberia the rivers run from south to north. Water transport has always been easy. Notice the desert area with its inland system of drainage in the south-west.

A glance at Fig. 27 shows that the northern rivers can only be used during the summer period. Archangel, at the mouth of the northern Dvina, is open for 177 days, Leningrad for 218 days, and even Astrakhan, in about the latitude of La Rochelle in France, is open for only 264 days. Rivers have to be free from floating ice before navigation is safe, and bridges have to be protected from the masses of ice (see Plate 12) moving down them in the thaw season.

One of the first large projects of the Soviet Government was to build a canal from the Baltic sea at Leningrad to the northern port of Soroka on the White Sea. This was started in 1931, and in under two years the *Baltic-White Sea Canal* was a reality.¹ It crosses the barren, ice-scraped and swampy region of Karelia, and is about 140 miles in length. The Neva links Lake Ladoga with Leningrad and then the canal follows the southern shores of Ladoga. This is linked to Lake Onega by the River Svir. North of Lake Onega several small streams and lakes are used, till the port of Soroka is reached on the White Sea coast. This canal helps to relieve the burden on the Murmansk railway, and in 1937 2.4 million tons of cargo moved along it. This consisted largely of apatite moving southwards from Kola peninsula to chemical plants near Leningrad, and petroleum was the bulk cargo carried northwards to Murmansk (see Fig. 102).

Not only has transport benefited, and Scandinavia become an artificial "island," but the varying levels of the water have been used to generate hydro-electricity. This now supplies wood and cellulose combines at Segezha and an aluminium plant at Matkozhinsk.

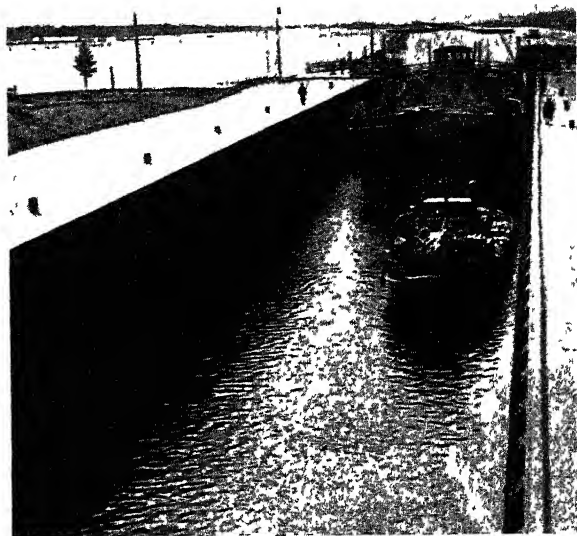
The Leningrad region is linked with the Volga by means of three old canals. One built in 1703 goes along the Volkhov and into the Volga near Kalnin via Vyshni Volochek; a second passes through Tikhvin (1811), now famous for bauxite; and the third passes south from Lake Onega via Lake Beloe and into the Volga tributary called Sheksna, near Rybinsk. The latter is called the Mariinsk system and was first constructed in 1808. With the completion, in 1945, of part of the Rybinsk scheme, the journey from Leningrad to Moscow was cheapened and shortened by 700 miles. It is now possible to go from Astrakhan to Moscow, Leningrad and Archangel by water (see Fig. 102). To do this three dams have been built, two across the Volga and one across the tributary stream, Sheksna. Thus an artificial lake called the Rybinsk Sea has been created which is as large as the county of Hampshire.

The Volga and its tributaries afford 7000 miles of navigable waterway, and large projects have already been carried out, whilst other schemes are, as yet, only planned. The most notable of these schemes is the *Moscow-Volga canal* which was opened in 1937 after nearly five years' work.

¹ This was largely constructed by convict labour. As a result of their good work many prisoners earned their freedom or else remission of their sentences. As an experiment with prisoners, and as an engineering task, it proved a great success.

Plate 64.
THE BALTIC-WHITE
SEA CANAL

This, the Stalin Canal, links Leningrad with the White Sea via the southern shores of Lake Ladoga, the River Svir and Lake Onega. It reaches the White Sea at Soroka, and was built in 1933 largely with the help of prisoners.



The idea of joining Moscow with the Volga had occurred to Peter the Great in the early eighteenth century, and work was begun in the nineteenth century but the task was left unfinished for the railway outstripped its completion.

The Moscow River, on which the capital stands, used always to be brimful of water after the spring thaws, but with the coming of the summer water used to reach a very low level and only vessels of very shallow draught sailed on it. Now, since the summer of 1937, the waters of the Volga flow past the Kremlin walls. The task of building the canal across the watershed was far from easy. It is 80 miles in length and involved the building of a large dam on the Volga at Ivankovo, and from here the water is lifted over the divide, made up of morainic material, in a stairway of six steps. The descent of 125 feet is made down five lock-steps to the Moscow river.

The canal is one-and-a-half times the length of the Panama canal, and the barrage on the Volga dams back the water and forms the "Moscow Sea," which would cover the Isle of Wight but for 20 square miles. Pumping stations lift the water from here into the canal. In addition, there are eight hydro-electric stations using the energy in the ponded water. These

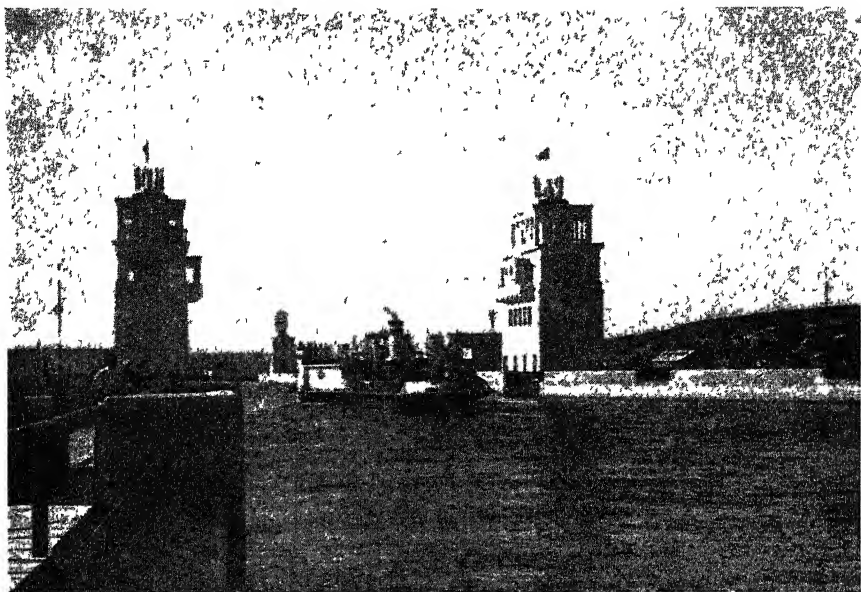


Plate 65 —THE MOSCOW-VOLGA CANAL

This large canal links the capital with the Volga and has made it possible to reach the Caspian Sea in large boats from Moscow. In fact, since 1937 Moscow has been a large inland port. The canal locks are ferro-concrete structures equipped with powerful pumps which work rapidly and automatically.

have a capacity of 66,000 kw, and help to work the pumps and move the automatic lock-gates. One of the artificial lakes is used for the water-supply of Moscow. This is called the Ucha reservoir.

All the installations are examples of modern architectural beauty. The river station in the outskirts of Moscow is at Khimki, where three-decker passenger ships or speed-boats can be seen alongside graceful yachts. A six-minute river-bus service is maintained between Moscow and the neighbouring towns by double-decker launches (Plate 66) worked by diesel engine and able to carry 150 passengers.

Another link in the "Great Volga" scheme was forged, when in 1944 the dam at Rybinsk was completed. This was necessary because in this upper section along the Volga the summer level upstream from Kazan fell to about 4 feet. Now the level has been raised to over 16 feet as a result of this dam. It can be seen on Fig 102 that some of these projects have now been completed. There are other dams at Uglich and at Kuibyshev, where one of the world's largest hydraulic engineering schemes is well on the way to completion. As we have noted above, improved navigation is

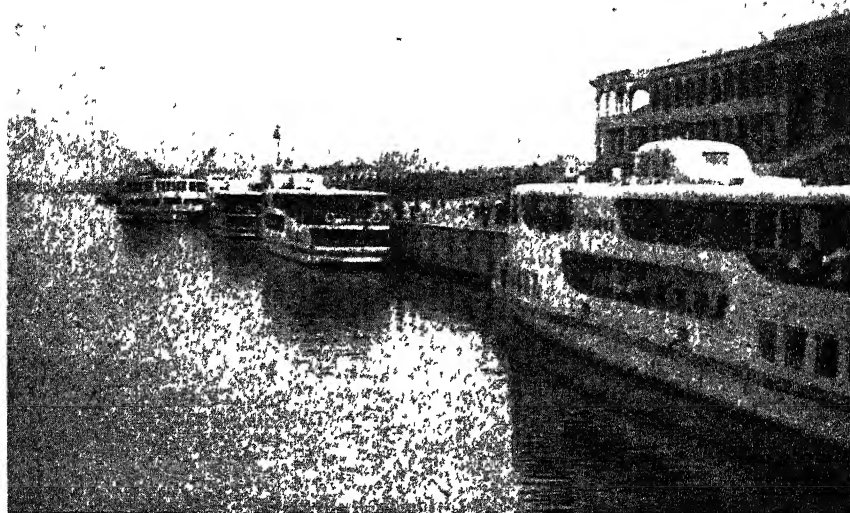


Plate 66 —KHIMKI PASSENGER PIER AT MOSCOW

From this pier of the Moscow-Volga canal steamers and motor-boats take passengers up and down the Volga. These vessels are modern and luxurious. Khimki is a well equipped port and is a popular "lido" in summer.

not the only consideration, but also the building of large power-stations and the development of irrigation schemes (see p. 158)

Other aspects of the Volga plan involve works on the Kama, the Vichегда and the upper Pechora. The aim here is to bring power to the forest region, and at the same time to tap the wetter regions of the U.S.S.R. The water from these Arctic regions will be made to flow southwards where it will help to make up for the deficit of water caused by irrigation and evaporation in the warmer south. When these plans become realities, the tonnage of water-transport will rapidly increase on these rivers. Even now Moscow is an inland port connected to three seas. During the Second World War, when Moscow had lost the Donbas, large tonnages of timber came down the Kama. Salt and wheat were brought from the Lower Volga. Special refrigerator ships like the *Admiral Nakhimov* brought fresh fish from Astrakhan and meat from the cattle-lands of Kazakhstan. Oil caravans brought petroleum from Baku into the very heart of Moscow.

The task of making Moscow a "port of five seas" (White, Baltic, Azov, Black and Caspian) was to have been one of the important parts of the Third Five Year Plan. This was to be accomplished by building the

Volga-Don canal where the Don "elbow" comes within about 25 miles of the Volga, near Stalingrad. Again, the details of the canal to carry 18,000-ton boats, and to supply six hydro-electric stations, have been worked out. Further, reservoirs are to be constructed to irrigate the dry Kalmyk steppes and sea-vessels are to reach Rostov by a sea-canal.

A start on the Volga-Don canal had been made, but the fighting before Stalingrad destroyed it all. Work will begin during the period of reconstruction.

Work is already half-completed on a canal link between the Sea of Azov and the Caspian sea, via the *Manych* depression and the River Kuma. This waterway for transport was begun in 1932, and it was also linked to the irrigation and hydro-electric schemes of the Stavropol regions of the north Caucasus. Water from the Kuban River is to be taken by a mountain tunnel into the Manych tributary called the Egorlyk. Although the Nazis destroyed much, the tunnel and the Kuban dam were saved. Irrigation was due to begin by June 1945.

The rivers of Central Asia are not really suited to transport, as they tend to suffer from shifting sand-banks and low water, of which much is used in irrigation. However, river-boats and tugs can navigate the Amu-Darya which is of substantial importance for freight; the Syr-Darya was opened for navigation for the first time in 1939.

These schemes have been mentioned in some detail because, when finished, they will radically alter the face of the country. They are not just Utopian ideas but each project fits into a larger and co-ordinated plan.

It must not be thought that the western rivers are the only ones to be used. In Asiatic Russia there is the Ob and its tributary the Irtysh, which are 3300 miles long, with the Yenisei, Selenga and the Angara about the same length. In addition, the Lena is longer than the Volga, stretching about 2770 miles from source to mouth. Finally, there is the Amur, which is close on 2000 miles in length. These rivers have not the same advantages as the western rivers which rise close to each other within the ill-defined water-parting of the Moscow region. They do allow east to west movement, however, by means of short portages. These have figured largely in the past (p. 125), and attempts will be made to link the Volga tributaries with the Ob and Irtysh systems, by using the Chusovaya and the Isset and short canals. Similarly, east to west tributaries could also link together the Ob, Yenisei and Lena waterways. As yet, there are no inter-connecting canals, but traffic is improving along the Siberian rivers. Two factors have helped. Firstly, the T.S.R. has been overloaded and other means have had to be found; and secondly, the northern outlet of these rivers is no longer a frozen, useless ocean. Ships along the *Northern Sea Route*, linking Murmansk with Vladivostok, and calling at the new ports along the Arctic seaboard, have altered the picture.

Perhaps it is not always realised how large these Siberian rivers really are. Not only has the Yenisei over 3000 miles of navigable waterway but

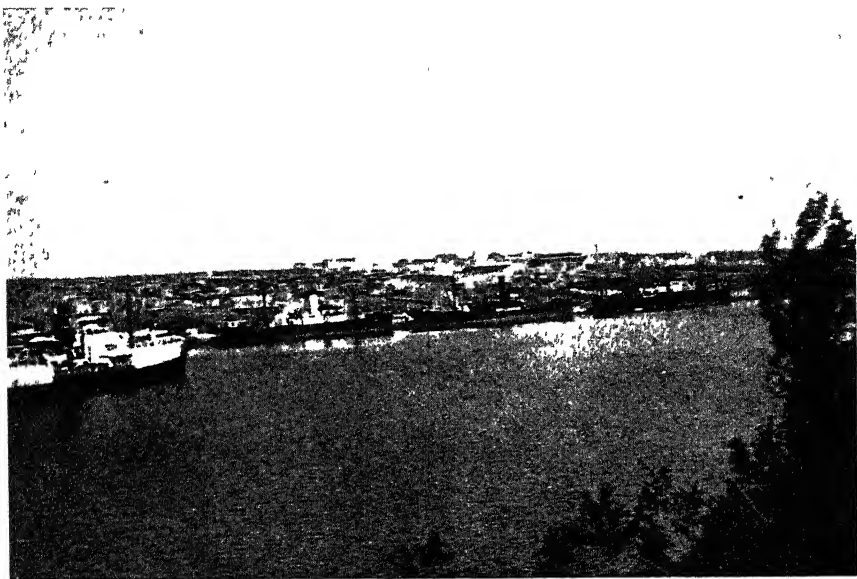


Plate 67.—THE PORT OF IGARKA.

This port on the Arctic Circle is some 250 miles up the River Yenisei, but since 1927 it has grown from nothing into a town of 18,000 people and serves the Northern Sea Route and the river transport. It has saw mills and is an important outlet for Siberian timber. The river at Igarka is almost 4 miles wide.

it is over 20 miles broad, and even at the port of Igarka (Plate 67), 400 miles upstream, the river is four miles across. At the river port of Yeniseisk, a thousand miles from the mouth, the width can be well over a mile in time of flood. Navigation by quite large river-boats is possible to Krasnoyarsk, where the T.S.R. bridges the main stream.

It was on the river banks of this self-same Yenisei that a steam yacht was built even before 1900, which opened a possible commercial routeway through the Arctic. It sailed down the Yenisei, rounded Scandinavia and reached St Petersburg. However, very little progress was made prior to 1932, when the Soviet Government set up the Northern Sea Route Administration under that pioneer of the Arctic, Otto Schmidt. The full story of the epic struggles and exploits of this northern sea-route, even over the space of a decade, is thrilling and packed with adventure. It is not possible to deal fully with this subject here, but it can be found elsewhere ¹

¹ Vide *Soviet Asia*, by Davies and Steiger (Gollancz, 1943), *40,000 against the Arctic*, by H. P. Smolka (Hutchinson, 1937); *Life on an Ice Flow*, by I. Papanin, *On top of the World*, by L. Brontman (Gollancz, 1938), *Anglo-Soviet Journal*, Vol. II, Parts 1 and 2, *Geography* (September, 1943)



Plate 68—ICE-BREAKER AT WORK DURING THE ARCTIC NIGHT

Strenuous efforts are made by these ice-breakers to keep the Northern Sea Route open for as long as possible. The photograph shows this is no easy task.

It was in 1932 that the converted Scottish whaler, called *Sibirakov*, of 1400 tons, made the voyage from Archangel to the Behring Strait in two months and four days. Previously, the ships had been forced to winter in the Arctic. The trans-polar flight of Soviet airmen was prompted, after the crew of the famous vessel, the *Chelyushkin*, had been rescued from the ice by Russian and American planes. The *Chelyushkin* had been crushed in the pack-ice off the Behring Strait in the winter of 1934.

There is no doubt that the Northern Sea Route has passed beyond the exploratory stage. Now, the Soviet Arctic fleet consists of over 160 vessels, forty of which are ice-breakers. One of the latest additions is the *Joseph Stalin*, which was built in the Leningrad yards in 1937. It is 345 feet long and 75 feet wide and displaces 11,000 tons. The ship's bunkers hold 4000 tons of coal and it carries a large seaplane and two smaller ones which can be used in emergencies. In 1939 the *Joseph Stalin* did the return journey from Murmansk to the Behring Strait—a round trip of 7600 miles.

Even in 1935 over 230,000 tons of cargo had been transported by this route. Now, freighters of 5000 tons carry the bulk cargoes and smaller coastwise boats deal with the local shipping. This speeds up the transport, and the new ports, like Dickson Island, Tixie Bay, Ambarchik, Providence

Bay, have mechanised dock-facilities which speed the turn-round at the ports. The open season is about 100 days, which enables ships to leave the western ports of America and travel the six thousand miles to Archangel. Now, thousands of tons of freight have been diverted from the T.S.R. route, and timber, furs and minerals leave the Ob, Yenisei, Lena, Kolyma and Indigirka via the Northern Sea Route. Igarka is a port of 18,000 people, whilst Nordvik exports salt, Norilsk sends nickel and other metals up the Yenisei, and Anderma and Vaigach have mines for zinc and fluor-spar.

Compared with the tonnage moving along the Soviet railways, or even along the Volga¹ system, the freight moving along the Northern Sea Route is as yet quite small. It requires ice-breakers, radio stations, and over fifty meteorological stations, in addition to air patrols, and only operates for rather less than a quarter of the year. Nevertheless, the success or otherwise of this route can only be judged in relation to the transport problems of the whole of the Soviet Union. It must also be remembered that Moscow is about 5500 miles distant from Vladivostok along the T.S.R., and that there is strategically a most vulnerable stretch between Irkutsk and the Pacific ports. Now, the east is linked with the west by an alternative all-Soviet water-highway, and this, coupled with the development of the Arctic region and its waterways, has been deemed a sufficient advantage to spur on further development. It will also be apparent that the Arctic agriculture (pp. 170-73), Arctic industry (p. 233) and the Arctic waterway all fit into one interrelated scheme.

2 RAILWAYS

There is no doubt that the economic development of a region, or country, and its suitability for settlement, can be judged largely from the density of the railway net. As can be seen in Fig. 120, even in the western regions of the U.S.S.R. there are still areas which are more than ten miles from a railway. The movement of goods and people is not too easy. If similar maps were drawn for Western Europe, the British Isles and the Eastern half of the U.S.A. they would be absolutely white. This means no place would be over ten miles from a railway.

Now in contrast, the railway net of the west is very dense when compared with Siberia and Central Asia. Although, as we shall see, there has been much development since 1920, the railway pattern still reflects its function during the last half-century of Tsarist times (1840-1917). During this period, the railways converged on Leningrad and especially on Moscow. Food and raw materials moved along them from the exporting regions. Long straggling trunk-lines tapped the "colonial" territories of Central Asia and Siberia. Moscow acted as the economic "spider" at the centre of the railway cobweb.

31.9 million tons in 1939

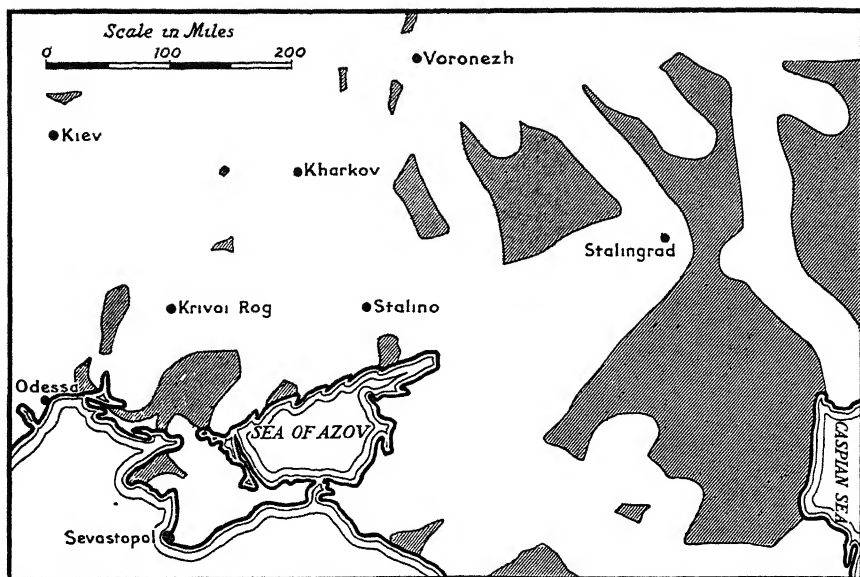
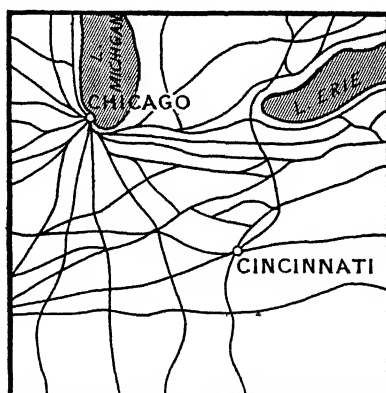


Fig. 120.—AREAS IN THE UKRAINE OVER TEN MILES FROM A RAILWAY.
The areas which are shaded have over ten miles to travel to reach a railway



(a) The Ukraine



(b) The Middle West

Fig. 121.—THE RAILWAY NETWORKS OF THE UKRAINE AND THE MIDDLE WEST IN U.S.A.

These two areas are comparable in that they are both important farming regions with other industrial centres. The Ukraine has one of the closest patterns in the U.S.S.R. and this looks very open when compared with a similar area in America. The scale is uniform, about 220 miles to one inch.

It was in 1838 that the first railway was built in Russia. This, a horse-railway for one year, connected St. Petersburg with the Tsar's residence at Tsarskoe Selo (now Pushkin). Between 1843 and 1851 the railway between St. Petersburg and Moscow was built, and by 1855 there were about 650 miles of railway line in Russia¹. By 1913 the railway system had expanded to over 43,000 miles (Fig. 122) and the main railway pattern, as seen to-day, had been laid

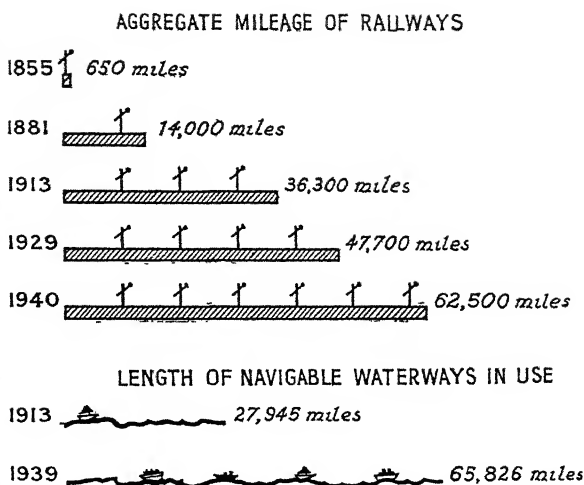


Fig. 122.

This shows the length of navigable inland waterways and takes no account of sea-routes

We have noted that the young Soviet Republic did not inherit a good railway legacy, for some 7000 miles were ceded to Poland and the other new western states. Then much of the remaining 36,000-miles system had been damaged by the Civil War and Intervention, and it has been estimated that only 10,000 miles were intact. In fact, it was not until 1926 that the mileage of 1913 had been restored. Since 1917 the average rate of expansion has been over a thousand miles a year so that by 1940 there was over 62,000 miles of railway in the U.S.S.R. Of course, the Second World War caused thousands of miles to be smashed in the western provinces, and reconstruction is again the order of the day. However, the demands of modern war caused the damage to be quickly repaired, otherwise the advance of the Red Army would have been prevented. The Russian railways are on the broad gauge (5 feet), and this was both an advantage and a disadvantage in time of war. In order to have through trains many miles of track had to be relaid. However, a suggestion has been considered by the Soviet Government to restore some of the railways on the standard gauge, in conformity with the other western countries.

Apart from the increase in the rail system, other changes have taken place which date from 1935 in the main and are linked with the name of Kaganovich. For example, the small and less-efficient locomotives have

¹ U.S.A. had 18,374 miles of railways in 1855, and 261,036 miles in 1913, and 261,849 miles in 1923.

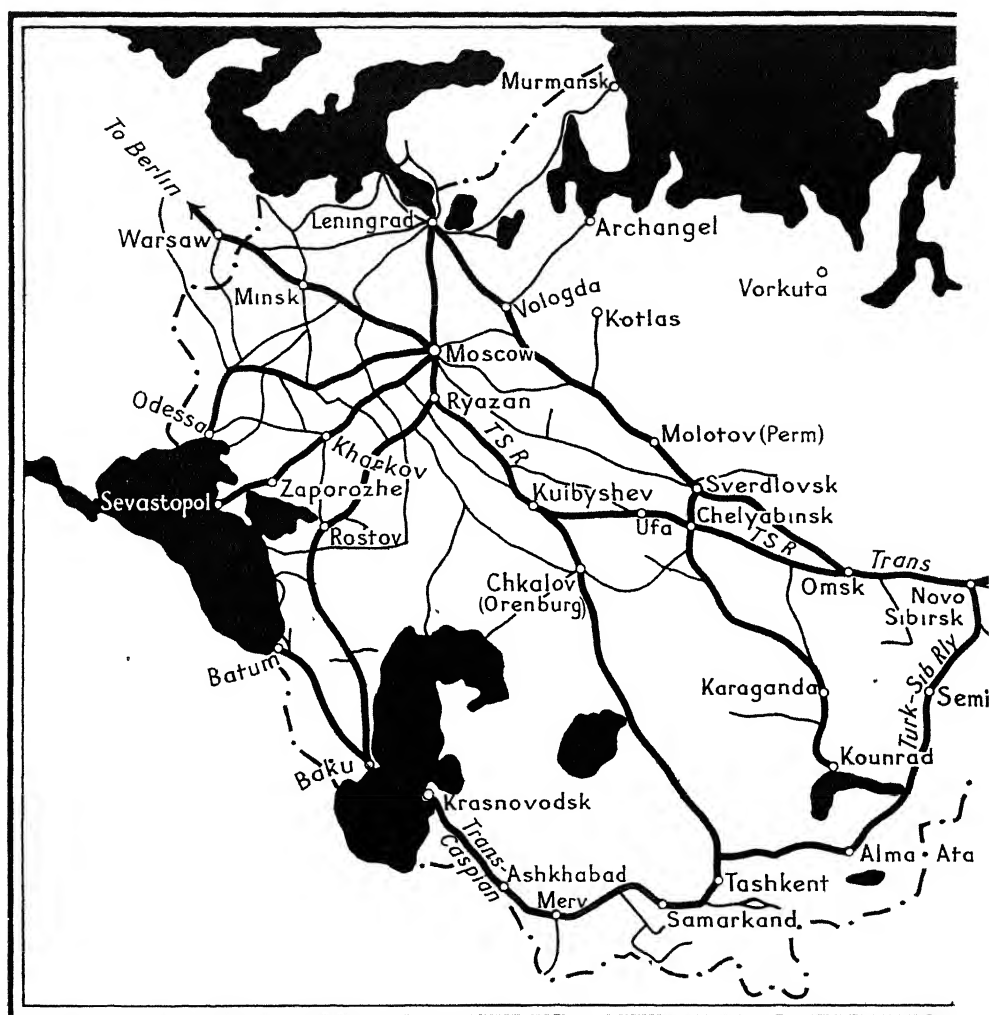
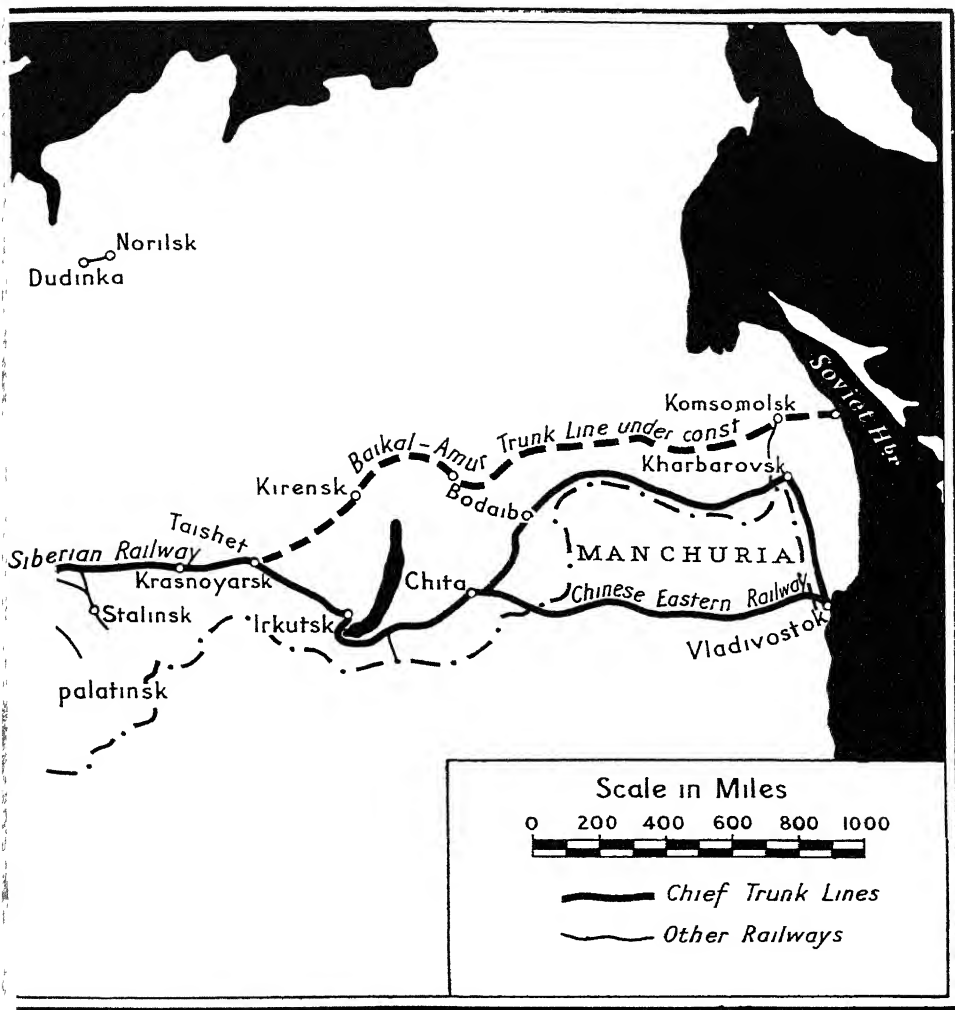


Fig 123.—THE MAIN RAILWAY
There is now a railway



LINES OF THE SOVIET UNION

linking Kotlas and Vorkuta

been replaced by new types like the "F.D.," "J.S." (Joseph Stalin) and the "S.O." The latter can run for about 1000 miles without taking in water because it has a special steam-condenser. This is most important when desert regions have to be crossed. Similarly, the rolling stock has been modernised, and automatic coupling and braking are now generally used.

There are also over 1000 miles of electrified lines, and diesel-electric locomotives are in use alongside others that use a direct-current of 3000 volts. The first electric line was built in 1926 from Baku to Sabunchy, and the others are to be found in the Moscow, Donbas, Caucasus and Ural regions. Mention must be made of the Moscow Underground Railway. It is called "the Metro" and all the people of the U.S.S.R., and especially the citizens of Moscow, are most proud of it. The Metro is not as long as the London Underground but compares with it most favourably in efficiency, speed and safety. To be truthful, the stations are more beautiful; they are free from garish advertisement, and the walls are faced with polished granite, while roofs and floors depict various figures and scenes in striking mosaics. The first $7\frac{1}{2}$ miles were opened in 1935, and in 1939 there were about 20 miles of track. The tram service from the centre to the Stalin Automobile Plant used to take about an hour: the Metro does it in 8 minutes (see p. 305).

Table 7
TOTAL FREIGHT CARRIED

	million tons		
By railways	553.6	(1940)	83 per cent.
By inland waterways .	66.6	(1938)	10 " "
By sea	40.6	(1935)	6 " "
	thousand tons		
By air	51.1	(mails and freight. 1939)	

Perhaps the most salient point to remember about Soviet transport is the dominant position held by the railways. Approximately 80 per cent. of the total freight is carried by rail, whilst the inland waterways carry 10 per cent. and the ocean going vessels about 6 per cent. (see Table 7).

Since we have sketched the amazing progress of Soviet industry it is quite easy to see that a very great strain has been placed on the transport system. The fact that industry now relies on home raw materials rather than on imports involves the transport of bulky articles. Wherever possible, long cross-hauls have been eliminated. Any case of carrying coals to a Soviet "Newcastle" is strongly criticised. In 1940¹ 470,000 tons of coal

¹ Report on Economic results of the U.S.S.R. in 1940 to the 18th All-Union Conference of the Communist Party (N. Voznesensky)

were transported from the Kuzbas to the Tashkent railways, much of which the engines burnt in transit. Local coalmines should have supplied it

It is not possible to describe the rail pattern in detail but certain trunk arteries call for some comment. These can be seen in Fig. 123.

(a) *The Trans-Siberian Railway (T.S.R.)*

The T.S.R. links Moscow with the port of Vladivostok on the Pacific seaboard, and was built for both economic and strategic reasons. The development of Siberia was handicapped by lack of transport; and at the end of the nineteenth century Russia also became apprehensive of the policies pursued in China by Japan, France and Great Britain. This railway is about 5300 miles in length and was begun in 1891. At first, ferry steamers carried the trains across Lake Baikal, but in 1905 the line was completed round the southern shores. From Moscow the line runs through Ryazan, crosses the Volga at Kuibyshev (Samara), and then goes through Ufa and across the Urals to Chelyabinsk. The River Irtysh is crossed at Omsk and the Ob at Novosibirsk. At Krasnoyarsk the line bridges the Yenisei and proceeds to Irkutsk. Originally the line was built across Manchuria to Vladivostok. This section is called the Chinese Eastern Railway, and was completed in 1903. It had the advantage of cutting off the great Amur "bend" but it was not in Russian territory. The all-Russian route was therefore completed via the Amur and Khabarovsk in 1917.

In 1931 Japan overran Manchuria and as a consequence the Soviet Union sold its rights in the Chinese Eastern Railway to Japan.¹ Since then the T.S.R. has been modernised and the track is now doubled throughout its entire length. In order to reduce the risk of this important artery being severed in time of war, another railway has been started to duplicate the route, some hundred miles or more to the north. This new Baikal-Amur line diverges from the T.S.R. at Taishet about 200 miles west of Irkutsk. It then strikes eastwards cutting the Lena tributaries at navigable points, as at Kirensk and Bodaibo, so linking river and rail transport. The Amur will be crossed at the new industrial centre of Komsomolsk and the Pacific terminal will be at Sovietskaya Gavan (Soviet Harbour), some 500 miles north of Vladivostok. This was a former fishing village which now boasts a large fish cannery and ship-repair yards (see Fig. 124).

(b) *The Trans-Caspian or Turkistan Railway*

It was in 1886 that the small Caspian Sea port of Krasnovodsk became the starting-point of this railway, which at first ended at the oasis of Merv. However, the route was completed to Samarkand, Ferghana, and Tashkent in 1905. To replace the water-link by way of the Caspian Sea and the

¹ By the treaty signed in August 1945 between China and the U.S.S.R. the Chinese Eastern Railway is to be maintained by the U.S.S.R. and used by both countries.

River Volga, Moscow was linked to Central Asia by a *direct* railway line in 1917. This now runs through Kuibyshev (Samara), Chkalov (Orenburg), and across the semi-desert of the Aral Sea region and the lower Syr-Darya to Tashkent. It was this Turkistan Railway which helped to bring Central Asia under the sovereignty of Moscow and to make it a colonial appendage of the centre. Now, with the economic emancipation of the Central Asian Republics this route no longer acts as a tap-root sapping the wealth and vitality of the region.

(c) *The Turk-Sib (Turkistan-Siberian) Railway*

The important industrial area of the Kuzbas has since 1930 been linked to Central Asia by the Turk-Sib Railway. This leaves the T.S.R. at Novosibirsk and follows an old trackway to Semipalatinsk, Alma Ata and thence to Tashkent, after crossing almost 1000 miles of semi-arid country. This route completes the railway circle round Central Asia. It allows, among other freight, the interchange of timber and wheat from Siberia for the cotton and silk of Central Asia.

Many other links have been forged in the last few years. These are either new trunk-routes for fast traffic, by-pass lines, or single "spurs" which tap new mining or industrial areas. In these categories can be placed the new direct route from Leningrad to the Ukraine to the west of Moscow and the new route from Moscow to Rostov-on-Don and on to Baku. The important mining regions of Kazakhstan are now linked to the T.S.R. by the line from near Omsk to Karaganda, and thence to the copper-smelting and mining centres on the shores of Lake Balkash. A further route links Karaganda with the Urals via Kustanai.

During the First World War the Leningrad-Murmansk line was built as a route for supplies from the Western Allies. This also bore heavy traffic in the recent war. The only other lines through the forest and tundra area are the Moscow-Archangel line via Vologda, and quite recently lines have been built from Kotlas to the Upper Pechora and to the Arctic shore, and between the nickel and coalmining centre of Norilsk and navigable water at Dudinka on the mouth of the Yenisei almost in latitude 70° N.

3. SEA TRANSPORT

It is customary to think of the Russians as "land animals," in contrast to the British as "sea animals." This was truly the case in 1913 when Russia possessed only about 1 per cent of the world's marine fleet. Then the imports of manufactured goods and the exports of grain, timber and petroleum were carried by foreign ships. In 1937 Soviet merchant men carried 50 per cent of all the exports and 95 per cent of all the imports. This change has occurred since about 1930, for at that date Soviet ships only carried 4 per cent. of the exports.

There has been a marked contraction in the volume of Soviet exports since 1913, when Russia exported over 24 million tons of goods which were 70 per cent. agricultural products, mainly grain. Since the Five Year Plans some goods have been exported to defray the cost of the imports of machinery and non-ferrous metals. However, the export of agricultural products has been reduced, and the total tonnage leaving Soviet ports was only 11 million tons in 1938. Petroleum, industrial products, like metals and machinery, were the chief commodities exported, along with timber and timber products, which accounted for about 25 per cent.

Russia's foreign trade was chiefly with Great Britain, Germany and the U S A. This, of course, varies with the signing of trade agreements, and other economic and political factors. Nevertheless, it is quite clear that the western countries of Europe are the natural markets for timber, petroleum and other surplus products from the U S S R.

In addition, the U S S R. could absorb many of the surplus consumers' goods from the industrial areas of Western Europe, and could fit into a unified and planned economy in the world, despite the fact that she is almost self-sufficient for all primary commodities.

The U S S R. is not deficient in good ports. The biggest difficulty confronting her is the freezing-up of rivers and harbours in winter but with the help of ice-breakers the open season can be slightly extended.

The chief warm-water ports are on the Black Sea coasts, yet even here, those along the Sea of Azov are ice-bound for four or five months. Odessa, founded in 1795, is the chief port for wheat and has modern warehouses, mechanised loaders and a cold-storage plant. A little farther east, there are Nikolayev and Kherson which export wheat, iron and manganese from the Ukraine. Sevastopol is the naval base. Along the Azov coast, Mariupol exports grain and coal, some of which is received by Kerch. Novorossisk has a deep anchorage for large vessels, and exports wheat and cement. Poti deals with the manganese ore from Chiatur whilst Tuapse and Batum are terminals for oil pipe-lines; and oil tankers leave their harbours for south Russian ports.

On the Caspian, Baku deals with the largest tonnage of petroleum, much of which travels to the Volga after being transhipped at Astrakhan into river tankers. Makhach-Kala is a subsidiary oil port (see Plate 79). On the opposite shore, Krasnovodsk exports cotton, and receives grain and timber products.

Leningrad has been until recently the only Baltic port, but it has the disadvantage of being ice-bound for over two months. It is the great timber port of the Soviet Union with long quays, now equipped with elevators and electric cranes. The shallow Gulf of Finland is dredged and a channel 30 feet deep is kept open. In the future, Riga, Tallinn, Liepaja and Memel will become more important and deal with Soviet traffic through the Baltic Sea.

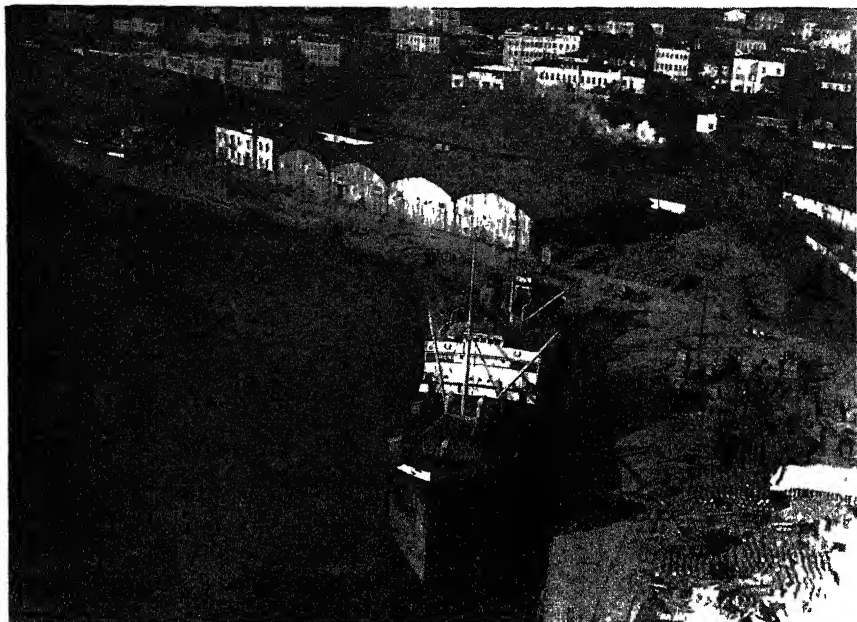


Plate 69.—VLADIVOSTOK

This important Pacific seaport is situated on a peninsula called the Golden Horn, which gives it a good water-front. Although in the same latitude as Marseilles it freezes in winter from mid-December to mid-April. It is the terminus of the T. S. R. and has a fishing fleet, canneries and a shipbuilding yard.

On the Arctic Ocean, Archangel functions as the chief timber port despite its being closed for half the year (see Plate 55). During this closed period transport is still possible through the *ice-free* port of Murmansk. The minor ports like Dickson Island, Dudinka, Igarka, Nordvik and Tixie Bay are expanding with the development of the Northern Sea Route.

The most important port on the Pacific coast is Vladivostok which is also a naval base and the terminus of the T. S. R. and the Northern Sea Route. It used to be blocked for as long as 110 days in the winter, although in the latitude of Marseilles (see p. 44), but now can be kept free by ice-breakers. Other timber ports are Magadan and Okhota. Port facilities have been improved and there are floating docks of 5000 tons capacity at Vladivostok, Soviet Harbour and Petropavlovsk on Kamchatka Peninsula. These ports function as fishing ports, as well as being commercial and naval bases. The latter port is kept open by the warm Kuro-Sivo current, and can now boast new shipyards, a cannery, fish-curing sheds, and cold-storage facilities.



Plate 70.—A NEW ROAD IN THE FAR EASTERN TERRITORY.

This looks very much like a Surrey lane, but it represents the coming of wheeled vehicles to the formerly deserted and sparsely settled parts of the Far East. One such road links Yakutsk with the T S R.

4 ROAD TRANSPORT

The paucity of good roads in Russia has been remarked upon by many writers. Just before the Revolution in 1917, Russia had three times as many good railways as roads. The roads that were found had poor surfaces. They were mainly dirt-roads which became quagmires during the thaw periods. There was an absence of wheeled traffic and Russia lagged behind the rest of Europe in motor transport, and in 1932 there were only some 75,000 motor vehicles and these mainly of foreign manufacture, restricted to short journeys near the main towns.

Since the First Five Year Plan of 1928 every year has seen the addition of mile upon mile of modern roads. Some are of stone, or of the ordinary dry-macadam, others are made of tar-macadam, ferro-concrete and asphalt. Over 800 miles were added in 1928 and during the period 1931-1935 116,000 miles of metalled road were built. Since then the road network has grown denser and the number of motor vehicles increased to over 800,000 in 1940.

One of the first things to strike the eye of a foreign visitor to the U S S R is the width of the streets in all the larger cities. There is the famous Moscow

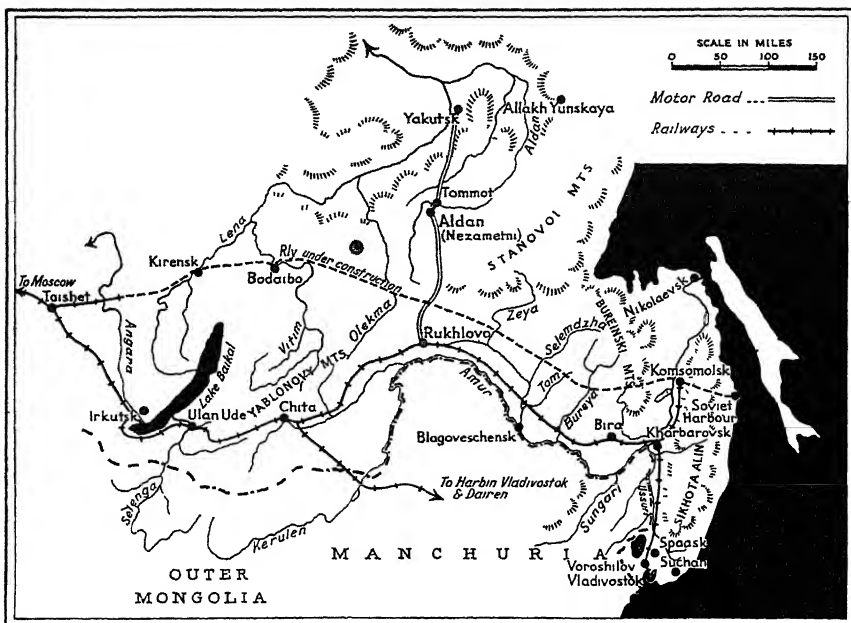


Fig 124 —SKETCH-MAP OF THE SOVIET FAR EAST.

Highway, which leads south-eastwards from Leningrad. Leningrad and Kiev are linked ; so too are Moscow and Kiev. In fact, most of the large towns are now connected with good roads. One of the latest roads to be completed joins Moscow with Minsk, the capital of White Russia. This motor-road, over 400 miles long, allows fast motor traffic to cover the distance in about eight hours. Bends are avoided and it is an even shorter route than the railway between the two towns.

There are many other trunk roads like the one from Leningrad to Tbilisi (Tiflis) which is carried under the Don by a tunnel at Rostov. The Trans-Siberian Railway is also duplicated throughout its entire length by a roadway which is able to deal with short-haul traffic. This means a great economy.

Perhaps some of the most striking roads are in the mountainous regions of the Caucasus and Central Asia. These can truly be called "roads in the clouds." In these areas motor transport is able to link formerly isolated valleys, and the roads are of both strategic and commercial importance. The famous Georgian Military Highway, which dates from the early nineteenth century, has been modernised, and allows road transport across the Caucasus (see Fig 118), via the Krestory Pass. The Mamison Pass

which has a summit altitude of nearly 9000 feet is used by the Ossetian Road. In Central Asia, even higher passes are used, like the one at 11,000 feet which permits the road from Stalinabad to reach Khorog. Stalinabad is the administrative centre of Tadjikistan and much work has been spent in recent years on building the roads to connect it with Osh, Frunze and Termez. Formerly there was little wheeled traffic in this deeply dissected republic—a region of high mountains and deep valleys

The Far East and Siberia have not been neglected, here serviceable roads link all the chief towns. Vladivostok has a highway linking it with Kharbarovsk and further north with Komsomolsk. Perhaps even more important are the roads which have been pushed into the formerly isolated regions of the Lena basin and north-east Siberia. Now the Amur-Yakutsk highway, built in 1929, allows Yakutsk to have connections with the T.S.R. This road passes through the gold-mining region of Tommot and Nezametn (Aldan). The road which now runs northwards from Irkutsk puts this town in contact with the Lena River navigation at the river port of Kirensk. Finally, the small ports along the Sea of Okhotsk act as outlets for the interior of the north-east

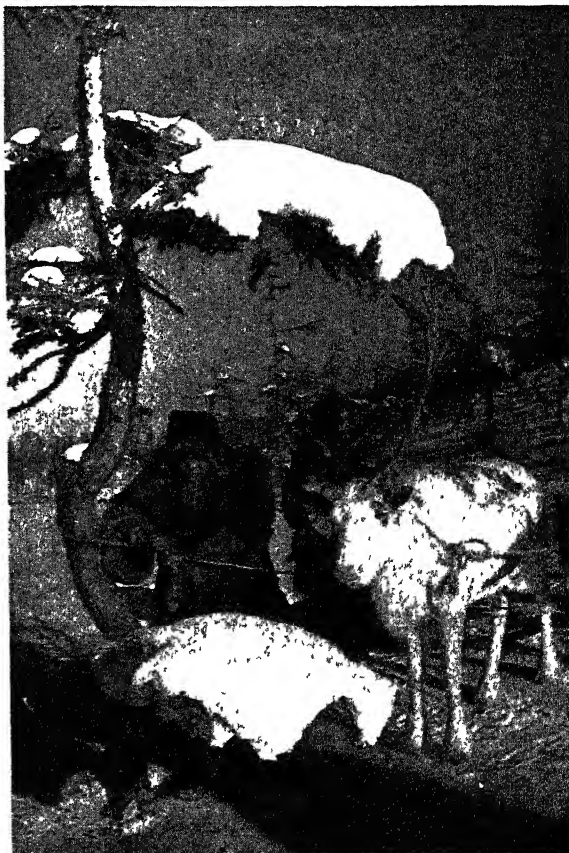


Plate 71 —WINTER TRANSPORT IN THE
NORTHERN FORESTS.

During the winter the dog or reindeer sledge is one of the easiest methods of transport in the Soviet Union to-day. The people are well-clad to keep out the intense cold and wear sun-glasses to protect their eyes



Plate 72 —THE PLANE USED BY THE POLAR FLYERS IN 1937.

It was in this plane, known as No 25, that Chkalov, Baidukov and Belyakov flew, in June 1937, from Moscow to Vancouver, Washington, U S A The journey was made over the North Pole and took 63 hours, and they covered a distance of 7100 miles by air and 5670 land-miles. The tragic death of Chkalov occurred in 1938

Siberian region since the construction of roads from Magadan to Kolymsk and from Okhota to Yakutsk

Although much has been accomplished in the last twenty years, the road transport of the U S S.R still lags behind that of U.S.A. and Western Europe It is with this fact in mind that the report from the Gorki Automobile Plant in 1945 falls into perspective. The new lorries now going into mass production, e.g "Gaz-51," and "Gaz-63," are to have a powerful engine. They are adapted for use on bad roads and are designed to have a low fuel-consumption.

5. AIR TRANSPORT

Air transport will do more for a country like the U.S.S.R. than for Great Britain. The aeroplane has already proved a great boon to the Soviet Union, for in this country one of the greatest difficulties is distance Of all means of transport at the present time, the aeroplane is the one best fitted for annihilating distance. The whole of the Soviet Union is now linked with a network of civil air-lines which exceeds in length any of the



Plate 73—THE OLD AND THE NEW WAY OF TRAVEL.

It is now possible to travel about the U.S.S.R. by air, but the traveller may have to rely on a dog sledge for the last few miles which may take as long as many hundreds of miles of air travel. This transport plane is of the Douglas D C 3 type.

other means of locomotion. Air-lines now connect all the outlying regions with the centre and with each other.

Table 8
LENGTH OF LINES OF COMMUNICATION
(in thousands of miles) 1940

Railways 62.5
Inland waterways	. 65.8 (1939)
Road	. 54.7 (1937)
Air	. 88.1

The expansion has been rapid, for in 1923 there were only 250 miles of air-routes, but by 1940 there were over 88,000 miles. Express routes, carrying both mails and passengers, connect Moscow airport with Vladivostok,



Fig 125.—LENGTH OF AIR-LINES.

and the journey is made in about twenty-four hours instead of fourteen days by rail

We have already mentioned Polar flights of the Soviet airmen in 1937. However, when Chkalov, Baidukov and Belyakov flew from Moscow to Portland, Oregon (U.S.A.) by crossing over the North Pole it was not to break records. It was purely incidental that the crew (Gromov, Yumashev and Danilin) did break the world long-distance record in the same year. They were pioneers trying to find out, and overcome, the difficulties in the way of a commercial air-line between U.S.A. and U.S.S.R. (see Fig. 1)

In the Arctic the aeroplane is almost the only means of communication apart from the dog-sledge or reindeer (Plate 73). The planes take people, goods and mails to and from the Arctic. They are also used for spotting the open channels in the frozen seas and patrols of planes work in conjunction with ships on the Northern Sea Route. Much time is also saved by the practice of aircraft reporting the presence and location of seals, whales, and fish, to the fishing fleet. Forest surveys and fire-patrols are now part of the normal routine of aircraft. Fire-patrols cover millions of acres of the Taiga during the summer months, when fires are most prevalent. Finally, aeroplanes spray malarial-infested swamps, as well as crops like cotton when the boll-weevil and other pests are active. Plagues of locusts can be fought by aircraft, and people in need of medical attention can now have their lives saved by speedy transport in the air ambulances which connect farthestmost Siberia with the skilled surgeon in the Moscow hospital.

CHAPTER X

POPULATION AND SETTLEMENT

1. *The Increase of Population*

In 1940 close on 10 per cent of the population of the world lived in the Soviet Union. The census of the U.S.S.R. for 1939 showed that its population was over 170 millions, and this figure was increased to 193 millions after the addition of the Baltic Republics, the Western Ukraine and White Russia.

However, the population of Russia has not always been so large, and has in fact doubled since about 1870 (see Fig. 126). This increase is not restricted to Russia for it is found in most other countries. In Russia it is due partly to the addition of new territory throughout the eighteenth and nineteenth centuries, as well as to the excess of births over deaths. The drop in the curve after 1914 was the result of the War 1914-1917, the Civil War and Intervention, and the loss of territory by the Peace Treaties 1918-1922.

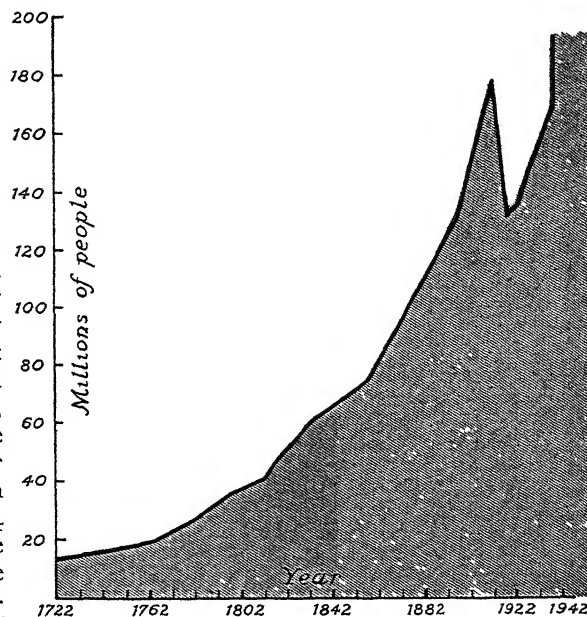


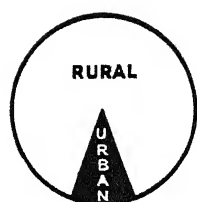
Fig. 126.—THE GROWTH OF POPULATION IN RUSSIA.

Between the two latest censuses, 1926 and 1939, the population of the Soviet Union has increased by 23 million people, and there is no doubt that the reduction in the spread of infectious diseases and the improved medical services have helped considerably.

2 *The New Changes in Town and Country*

One of the most striking changes during the period between 1920 and 1944 has been the increase in town population. This is not simply due

1863

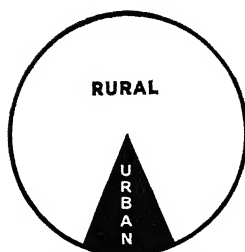


Towns with over 100,000 people



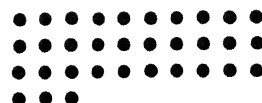
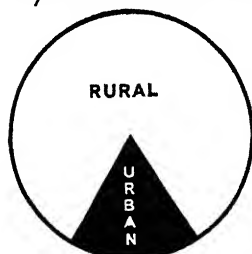
Population 76 millions

1897



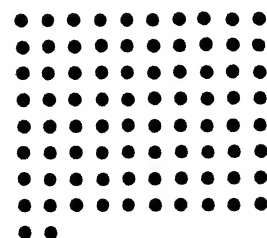
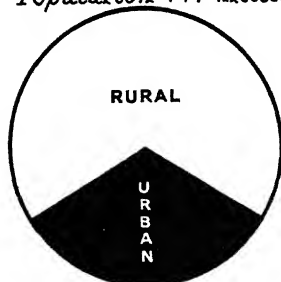
Population 129 millions

1926



Population 147 millions

1939



Population 170.5 millions

Fig. 127.—THE INCREASE OF TOWN-DWELLERS IN RUSSIA BETWEEN 1863 AND 1939

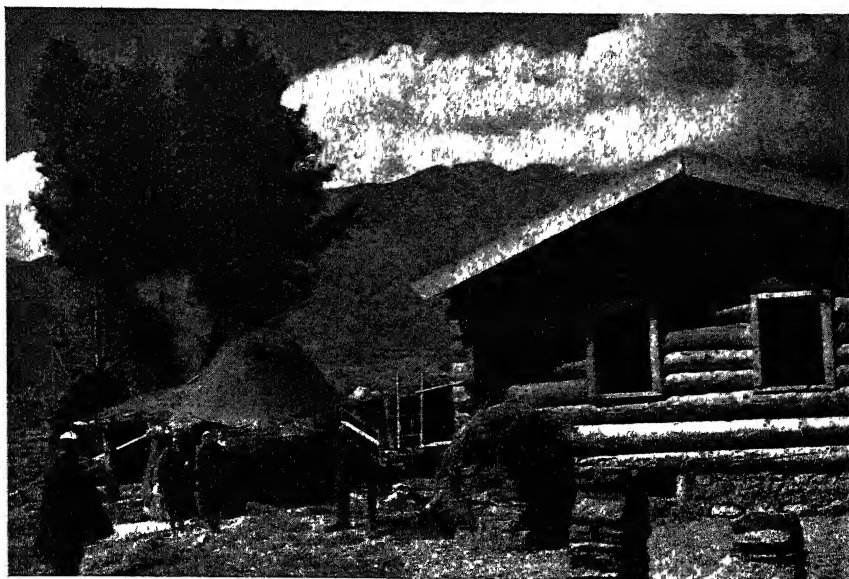


Plate 74 —THE NOMAD FINDS A SETTLED ABODE

In Central Asia many of the nomads who wandered about the steppes with their herds, putting up their yurts of felt over a framework of sticks, are now building permanent houses of wood.

to the well-known "drift to the towns," as seen in Britain. The actual town population increased over two-fold, from 23.3 million in 1926 to 55.9 million in 1939, but the rural population only declined by 6 million during the same period (see Fig. 127).

Agriculture has not suffered as a result of this new distribution of population. With the introduction and expansion of the collective farms, the agricultural production of grains, vegetables and industrial crops have shown a marked increase. There has been a definite move in the direction of a more uniform distribution of both population and industry. We have noted how new towns like Kirovsk and Igarka have sprung up as new names on the map, in the cold desert of the Tundra. Karaganda and Kounrad have risen in the semi-desert area of Kazakhstan: in Kazakhstan the town population increased by 228 per cent between 1926 and 1939! A generation ago, the Kazakhs were almost all nomadic herdsmen, and now their sons and daughters are workers in mines and offices. Whole peoples have changed their mode of life. Before the Revolution three-quarters of the country served as the home of nomads, who knew no really fixed abode. They depended on the growth of the grasses and vagaries of the climate. In their superstition they thought dirt brought luck and they were washed

twice in their lifetime, when they were born, and when they died ' Now the picturesque wigwam kind of tent—the Yurt—is giving place to a more practical, and fixed abode (Plate 74). Millions now know baths, hospitals and schools and a settled and sure life.

Thus we see that industry has been brought into the formerly backward country-districts. The village community now has its own mills, bakeries, mines and electric stations. The great differences in social amenities between town and country life are gradually being removed. It is not now a case of land-hungry peasants moving to new land in the east, but the planned development of new communities in Siberia, the Far East and

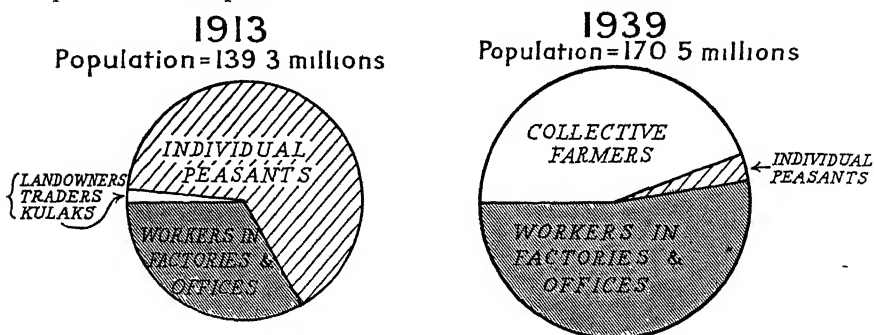


Fig 128 —THE CHIEF OCCUPATIONS OF THE PEOPLE IN 1913 AND IN 1939

the Arctic, each with its associated agriculture and local industries. Thus the Jewish Autonomous Region has grown up round the town of Birobijan along the banks of the Amur and its left-bank tributaries, the Biro and the Bijan. It has power stations, goldmines, knitting-mills, as well as grain, vegetable and livestock farms. Lower down the Amur the large new town of Komsomolsk, with a population of over 70,000 in 1939, has grown from a small fishing-village into a large river port with an important shipbuilding industry.

These facts can be seen in another way from Figs. 127 and 128. In 1913 Russia had a distinct rural character, 77 per cent. of the population living in the country as peasants or kulaks (12 per cent). Actually another 4 per cent were classed as rural factory or office workers. By 1939 only two-thirds of the population were classed as rural, but not all these people who live in the country earn their living from farming the land or tending animals. In 1939 the census showed that half the people were farmers whilst the remaining half worked for wages in towns and villages, either in industry or in clerical occupations.

The British Isles are noted for their large urban centres, but now the U.S.S.R. has at least 82 towns with over 100,000 people, whilst Great

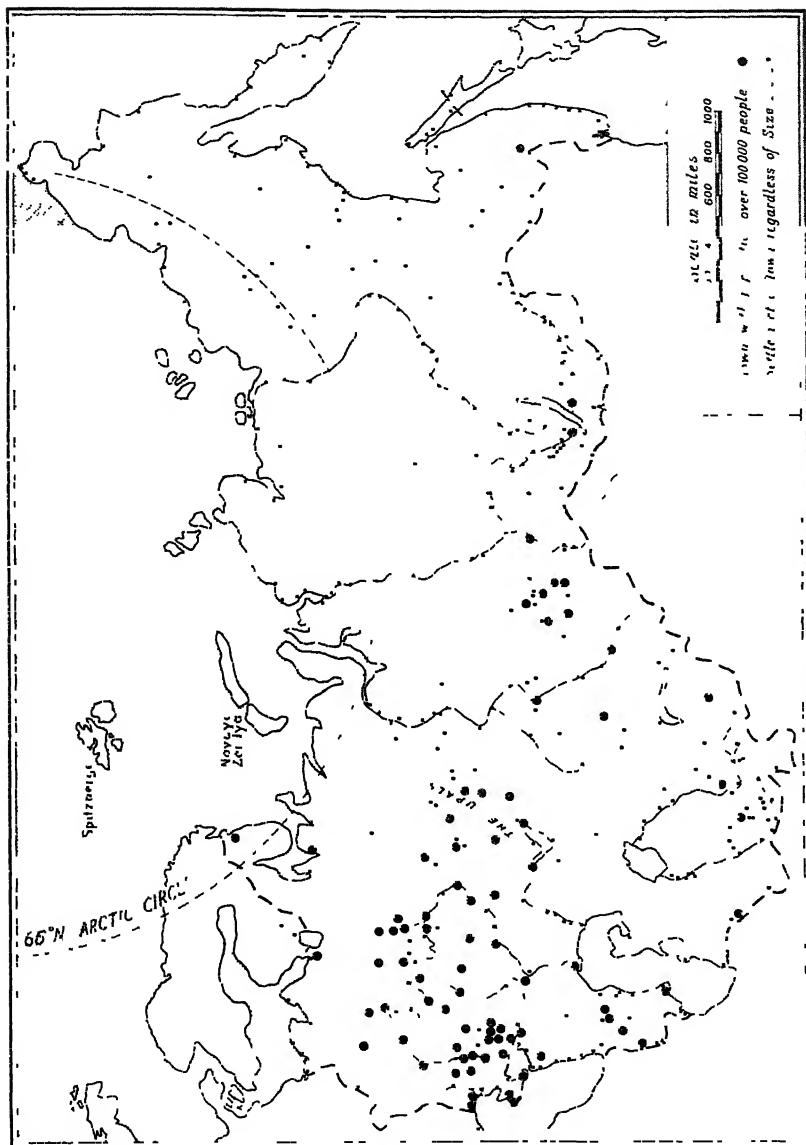
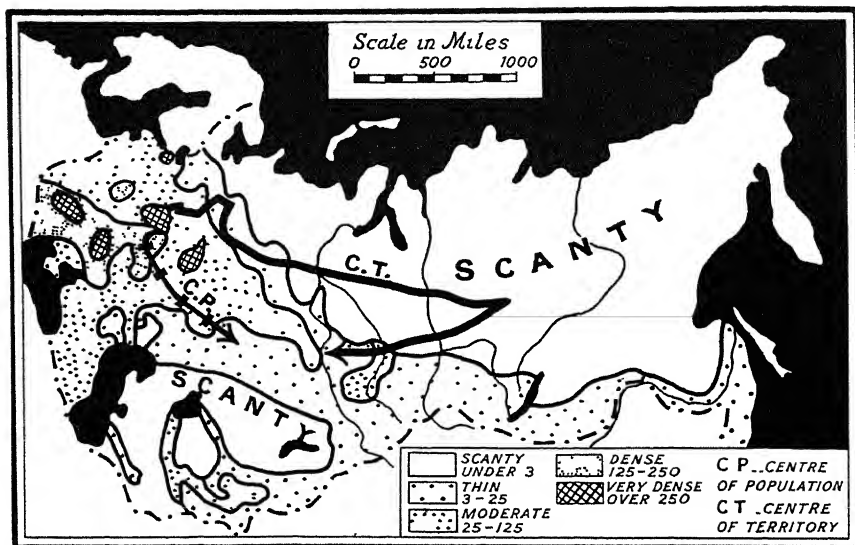


Fig. 129.—THE SETTLEMENT PATTERN OF THE U.S.S.R. IN 1939.
The greater number of urban centres are still to be found in the west but the larger centres of population in the Caucasus, Central Asia and the Kuzbas can be seen



[After B. Semenov *Tran-Shansky*

Fig. 130 — DENSITY OF POPULATION.

This shows the density per square mile and also the way in which the centre of Russian territory has moved throughout the ages. In similar fashion the "centre of gravity," as it were, of population, has moved. These two are now much closer together.

Britain and Northern Ireland have only 63. In 1860 the Russian Empire had four only and these were all in the west.¹

3. *The Geographical Distribution of the Population*

The population map of the U.S.S.R., which shows where the people actually live, still bears many resemblances to the general pattern which has existed throughout the last few centuries. By far the greater number of people live west of the Urals. The most densely settled area is wedge-shaped, with the apex towards the Central Urals, but it extends farther eastwards towards the Pacific coast and actually follows the T.S.R. This area almost coincides with the two natural vegetation regions of the Mixed Forest Belt and the Steppe (cf. Figs. 33 and 130). The more recent alterations in this general pattern have been an extension of dense settlement, spreading from the industrial Kuzbas, along the Turk-Sib and Trans-Caspian railways, and coinciding with the "fertile crescent" of Central Asia. The other extension from the Ukraine has been into the steppe-lands of the north Caucasus and to the south of the mountains in Transcaucasia. The other patches of relatively greater settlement follow the rivers of Siberia, and are dotted along the Arctic and Pacific seaboard.

¹ Moscow, St. Petersburg, Kiev and Kharkov

It is possible to calculate throughout the history of Russia the "centre of gravity" as it were, of both the territory of Russia and its population. On Fig 130 it can be seen that the centre of territory moved rapidly to the east in the seventeenth century and then turned to the south-west during the expansion into Central Asia in the nineteenth century. During the same period the bulk of the population remained in the Moscow and Upper Volga region. Throughout the nineteenth century the centre of the population moved towards the Middle Volga, and in 1926 the centre of population was about 2000 miles to the west of the geographical centre of the U S S R. This is just another aspect of the same lop-sided nature of Russia which obtained until the period of the Five Year Plans. Industry, agriculture and people were congregated in European Russia to the west of the Urals. Since 1926 the two centres have moved more closely together because over 3 million people have moved into the Urals, the Far East and Siberia from the west, and the western marchlands have been added once again to Russian territory.

4 *Types of Settlement and Types of Houses*

In the Tundra and the Coniferous Forest regions the density of population is low. Settlement is chiefly related to the nomadic occupations like hunting, trapping and fishing. Permanent settlements are becoming more numerous, and the sites which are chosen lie mainly in the river valleys. They are placed above flood-level, where thicker soils allow of agriculture, and obviously, south-facing slopes are the most favoured. Breaks in navigation, or waterfalls along a river, are usually picked out for village settlement, for sawmills and possibly hydro-electric stations can be placed on these sites. The lake shores and the sea coasts provide other sites where fishing, navigation and the interchange of goods are possible, especially since new ports are necessary for ships on the Northern Sea Route, e.g. Igarka (Plate 67), Dudinka and Novy Port. In this tundra-type of country the watersheds are

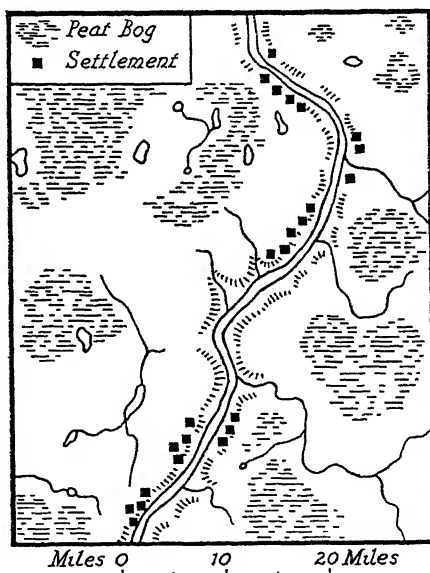


Fig 131.—TYPE OF SETTLEMENT IN THE TUNDRA AND CONIFEROUS FOREST REGIONS.



Fig 132.

This conical summer tent can be found in the Upper Kolyma among the Yukaghir people. It consists of three separate strips of soft, tanned reindeer skins fastened to a frame of birch.

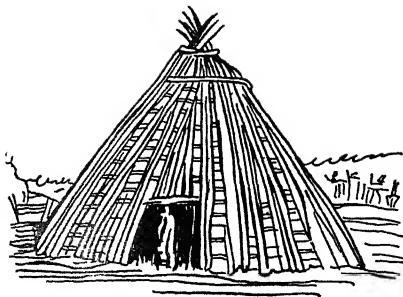


Fig 133

This summer dwelling of birch bark is the type used by the Yakuts. It is conical and often may be elaborately decorated.

almost invariably left unsettled, because the ground is usually badly drained and covered with peat-bogs which are impassable in the thaw period.

The nomads often erect temporary shades, or screens, which consist of a few sticks in the ground over which two or three reindeer skins are stretched to keep off the wind and snow. These may be used for just one night, and then the trappers move on. More elaborate conical tents very like the American Indian's wigwam are also built. These are made of reindeer skins which are sewn together by the women and placed over a frame of birch rods, held in position by bast rope, willow or reindeer thong (Fig. 132). In the south of Siberia and along the Amur, where reindeer are not so numerous, birch bark may be used in thin sheets instead of skins (Fig. 133). Usually the tents are transported from place to place on a boat, or sledge, since they are too heavy to carry. The Evyenkis of the Okhotsk region have a house which can be moved quite easily. This has a cylindrical lower section made of cross-pieces of wood, thonged together. These are then covered with rectangular sheets of birch bark, also sewn with leather thongs. The top is conical and covered with reindeer skins. In winter the lower part may be banked up with snow to keep out the excessive cold. Variations of this type of tent can be seen over all Siberia, especially among the Koryaks and Chukchis of the north-east (Fig. 134). These



Fig. 134.—CYLINDRO-CONICAL TENT
OF THE EVYENKIS

The upper conical part is covered with reindeer skins whilst the lower cylindrical part is of rectangular sheets of birch bark sewn together with thongs



Fig 135 —A FLAT-ROOFED LOG-HUT
USED MAINLY IN WINTER.

These blockhouses are to be found in the Upper Kolyma valley and are used by the Yukaghur tribe. The windows are often thick panes of river-ice, for glass is scarce

two peoples are reindeer-breeding nomads who move southwards into the forests in winter. In the forest, where wood is plentiful, flat-roofed log huts are built. These usually serve as permanent winter dwellings, and may have thick panes of river-ice to serve as windows (Fig 135). Sometimes the northern peoples build a storehouse of two or three floors which also acts as a summer dwelling. These are very reminiscent of the lake-dwellings of prehistoric times. The upper food-store is out of reach of the dogs and can be entered by a ladder. These are some of the temporary types of habitation which have been used for many centuries. They can still be seen, but now the new towns of the north are built with wooden houses of the bungalow type, which can be made quite warm and comfortable.

In the glaciated plains of the north-west, especially in the area of the Upper Volga, settlement has picked out the small morainic hills and mounds. The slopes of these are warmer and drier and arable crops can be grown. This is the rye, oats and flax growing region and it is interesting to see the tilled land on the side of a morainic ridge or drumlin (see p. 14) whilst the lower ground remains badly drained,



Fig 136 —SUMMER DWELLING AND
STOREHOUSE OF THE KAMCHADALES.

This Khamchadal storehouse serves also as a summer dwelling. It has two or three floors, the upper one is a food-store out of reach of dogs, whilst the lower floor can be used for storing clothes and household belongings

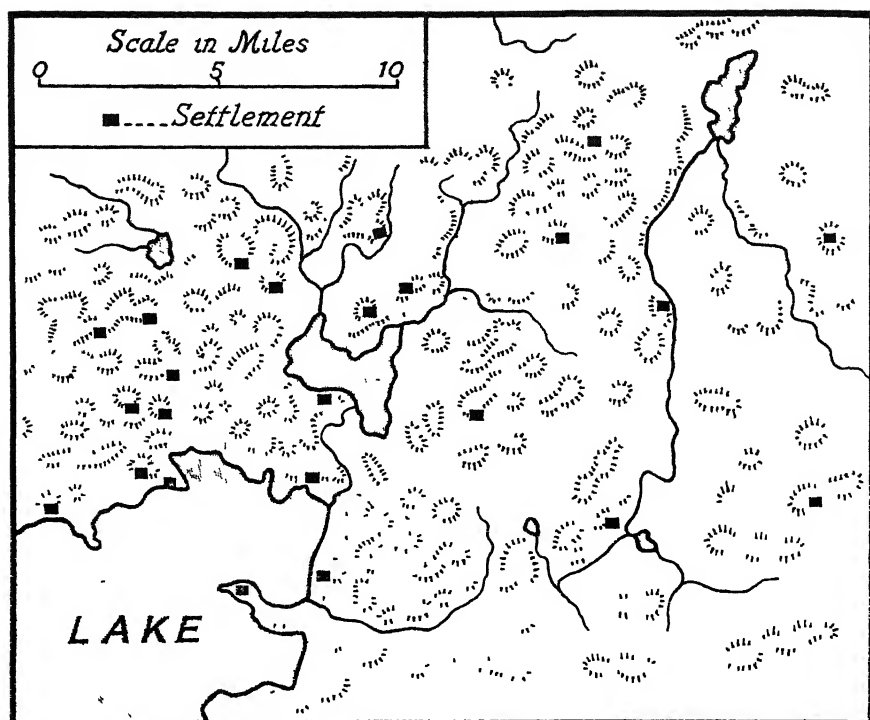


Fig 137 —SETTLEMENT ON THE GLACIATED PLAINS OF THE NORTH AND NORTH-WEST OF RUSSIA.

cold and swampy. In this forest land, which was the traditional home of the Russians, the settlement looks dispersed, but in actual fact the people are not scattered in small individual farmsteads. They are clustered in village communities and collective farms. Water is at no great distance below the surface, even on the hillsides, so that difficulty of water-supply would not cause the clustered type of village. Perhaps it dates from the need of people to band together for reasons of defence. Many of the cities grew up round the fort, or kremlin; e.g. Moscow, Kazan (Plate 75), Kalinin (Tver) and Novgorod. This strongpoint was surrounded by a wall and ditch behind which were built palaces, convents and arsenals, so that life could go on in time of siege. This central area is mainly forested by trees of mixed types and has been occupied by sedentary people since early times. The houses are mainly built of wood, and these can look quite beautiful when gables and windows have been decorated with carved mountings (Plate 76).



Plate 75 — THE KREMLIN OF KAZAN

Kazan was the old Bulgar capital and is now the administrative capital of the Tatar republic. Like Moscow it was a fortified river-point and the Kremlin formed the nucleus. It has a population of almost 400,000 and has chemical and engineering works (see also Plate 12).

In the steppe region settlement once again favours the river valleys. In some places the village communities are almost continuous. Generally the village is placed on an upper terrace, so that it is above flood-level, especially during the period of the melting snows. Some villages are placed on the river bluff, and where one bank is higher than the other the higher bank is invariably chosen. As at Kiev and Stalingrad, the original site has expanded into a large town situated on the western bluff (see Plate 4). The valley is preferred because here the water problem is easier; for quite frequently springs break out along it. The Russians moved along the water-courses, and therefore trade routes followed the valley. Then again the nomads of the southern steppes usually moved along the watersheds and it was easier for the new Russian settlers to fight from the valleys. The few trees that do grow in the steppe are found in the valleys and to the Russians trees meant safety (see Fig. 138).

Timber for building purposes has always been relatively scarce. It can be floated down the south-flowing rivers, but generally the people economise on timber where possible. Thus the main framework of the house is timbered, but some are reminiscent of the half-timbered English cottage. The walls

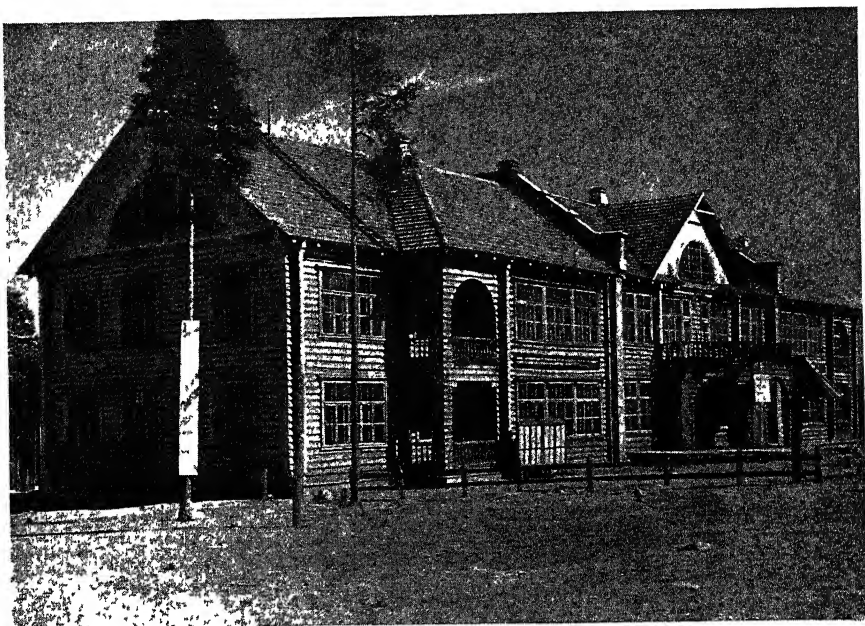


Plate 76.

A SCHOOL IN KARELIA

Wood is the universal building material in the forest zones of Russia and buildings have a pleasant appearance as in Scandinavia and Canada. Karelia is on the borders of Finland and the U.S.S.R.

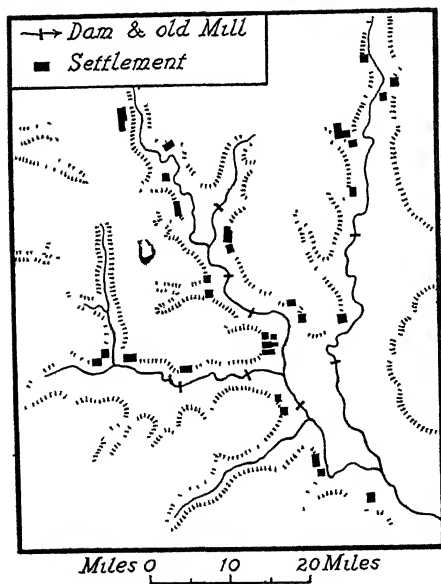


Fig 138.—TYPE OF SETTLEMENT
IN THE DRIER STEPPES OF THE
SOUTH

of the older houses are covered with clay or plaster and colour-washed, whilst the roof is often thatched.

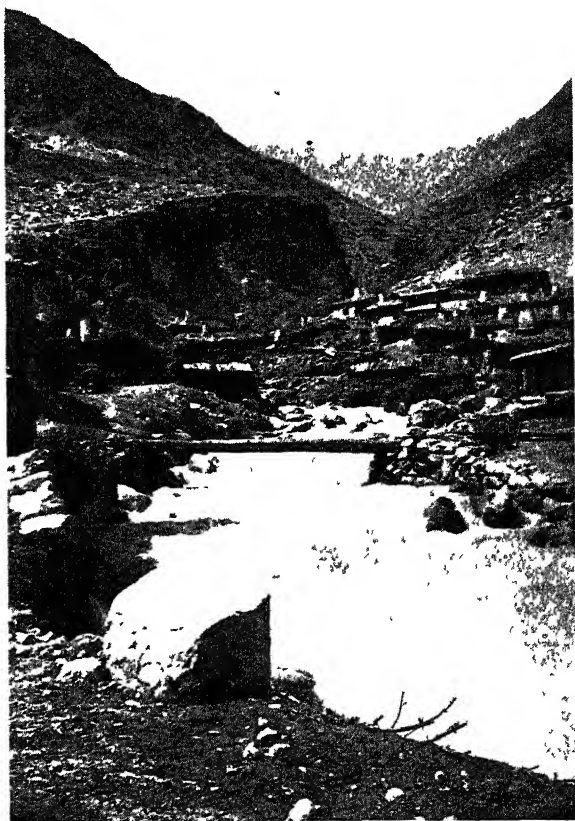
The steppe has been the traditional home of the Turkic peoples, and before they became settled they lived in the felt-covered "yurt". The framework was made of wattle or birch, covered with layers of felt made from sheep, horse or camel hair. The strips of felt were tethered down by cords. A fire vent was left in the top, and the floor could be made quite comfortable with rugs and carpets. As is now seen in Plate 74, the nomadic life of the stock-breeder is giving place to a more sedentary existence, and the yurt is replaced by the timbered permanent dwelling.

Now brick and concrete buildings are making their appearance, for man's dependence on local materials is no longer absolute. All the new

Plate 77

THE
EASTERN CAUCASUS

The rainfall decreases towards the east and the mountain slopes become but sparsely covered with vegetation. Difficulty of intercourse tended to make each valley community a separate ethnic unit. The picture shows a valley community near its water supply and with some measure of protection. It is situated at a bridge-point and where the valley widens out below an obvious break in the profile of the stream. The river has been rejuvenated and is in a youthful stage.



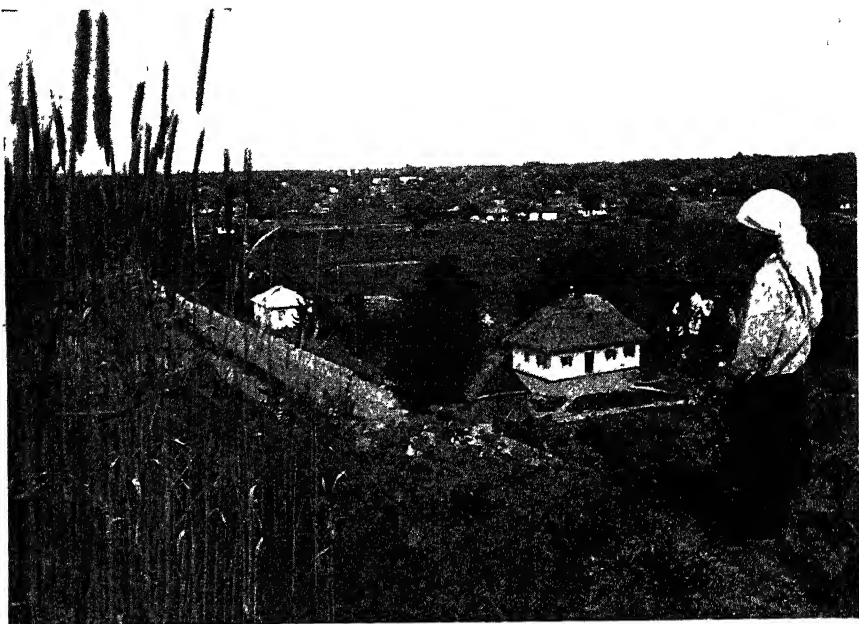


Plate 78—THE THATCHED COTTAGES OF THE UKRAINE

Since wood is none too plentiful in these former grasslands of the Ukraine the local building materials are wood for the frames, plaster and thatch. These white-washed cottages give the Ukrainian valleys a neat and trim appearance.

cities in either former forest, steppe-land or semi-desert regions are being built of modern materials in pleasing architectural styles. Where possible old styles are being modified, but used as the basis of the new houses, and the work is carried out in either brick or ferro-concrete or stone.

Prefabrication of houses in factories at Leningrad, the Urals and other centres has been practised since before 1930, and now all the modern building techniques of the world are in use in the U.S.S.R. Since wood is plentiful in the north, it serves as the main raw material. Plywood and fibre-wood are used for panels, while mineral-wool, made from slag, acts as the lining.



Fig 139

THE PLASTER AND THATCH
COTTAGES OF THE SETTLED
STEPPE-LAND

A Karachai house in Caucasia.
This is a Turkic tribe of the Upper
Kuban.

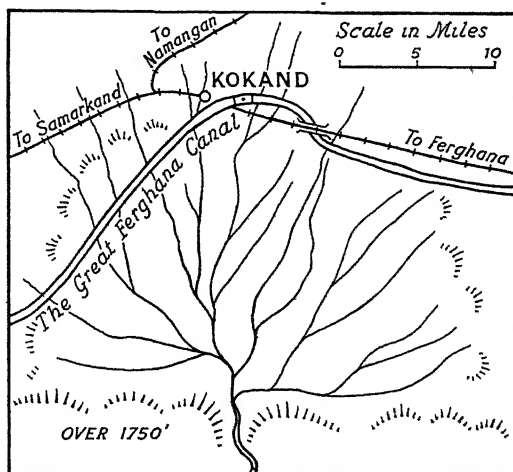


Plate 79.—MAKHACH-KALA (DAGHESTAN)

This port on the Caspian Sea shows the old-fashioned terrace type of town. The houses with flat roofs indicate a dry climate. This port deals with petroleum and has engineering works.

Fig 140.
THE SITE OF KOKAND
IN THE
FERGHANA VALLEY OF
SOVIET CENTRAL ASIA.

This is a good example of an oasis situated at a wet point in the desert where a stream has built out an alluvial fan on which irrigation is practised.



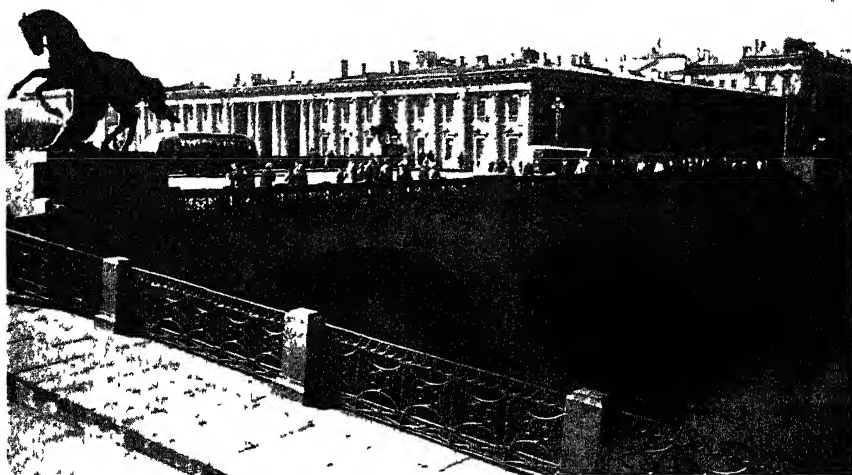


Plate 80 — Leningrad

This is the city of over 150 bridges built on the deltaic mouth of the River Neva at the head of the Gulf of Finland. Peter the Great founded St. Petersburg in 1703. Later it became Petrograd and was renamed Leningrad after 1917. In summer the bridges are necessary, but in winter people cross anywhere over the hard ice.

for the inside of walls. This poor conductor of both heat and cold insulates the house. The prefabricated houses are light and can be carried by rail and lorry from the main factory to the site. In Stalingrad and other devastated cities these methods are being widely used.

In the semi-desert and desertlands of Central Asia, the "dry points" are not chosen for settlement but rather the "wet points." The settlements are to be found at the oases. Many of the chief towns of Central Asia are built of stone in long rows rising in tiers up the hillside; one behind and above the other. They form veritable ramparts.

There are, of course, towns which owe their development to railways or mining, but it is not possible to describe in detail examples of all the various types of settlement. Let the interesting case of Moscow, the Soviet capital, suffice to demonstrate some of the principles involved.

5. The Site and Growth of Moscow

Moscow, like all the other old capitals of the world, has not grown to be the premier city in the Soviet Union for accidental reasons. Moscow has



Plate 81 —THE MOSCOW RIVER

This river on which Moscow stands has now many miles of concrete-faced embankments with many fine bridges. The depth of water has been increased. The photograph shows the Kremlin over the bridge, an apartment house on the right and the tall white building on the left is the Moscow Hotel.

become the capital because of certain geographical advantages possessed by the details of the site of the city, and by the advantages the city inherits by virtue of its regional position.

(a) The Site

There was a time in history when Moscow was not the chief town (see p 106). However, the first mention of Moscow is in the chronicles of 1147 and now traces of earlier settlements on this site have been proved. The original nucleus of the township was on the left bank of the Moscow River where the south-west part of the Kremlin now stands. Here two small streams joined the main river, and this strongpoint was situated on the high, outer, convex bank of a meander, and was therefore fronted by a water-barrier on three sides. This early Moscow was built as a fortified stronghold on the north side of the river because the danger from the marauding nomads was expected to come from the south. Thus we see that Moscow had certain similarities in the original site to both Paris and London.

The island opposite the Kremlin did not become the centre of the city.

as in the case of Paris, since this would not have been safe when the river was frozen. The ice could have been easily crossed.

The wooden stockade round the Kremlin was unable to withstand the Mongol, or Tatar, invasion. As a result, it was replaced by a stone one in 1367. However, in the fifteenth century Ivan III made Moscow the capital and himself the "Tsar of all the Russias." Throughout the centuries the Kremlin has always remained the centre of the town and contains cathedrals, built as early as the fifteenth century, and palaces, as well as the largest bell in the world. This bell weighs 200 tons and was cracked before ever it was sounded.

Outside the Kremlin wall there grew up the Kitai Gorod (or China-town) which was surrounded by the Chinese wall in 1532. In this area the merchants lived who most certainly dealt in goods from the East and China, hence the name. This wall was demolished in 1934 and is now followed by a semi-circular road. A wider ring-road, now occupied by the main boulevards, has been built on the site of another wall which surrounded the "White Town" (Bely Gorod). The outer city limit of the eighteenth century was marked by a rampart built in 1742 of earth and wood. This enclosed the "Earth Town" (Zemlyanoi Gorod), and it is interesting to notice that the main railway stations and the factories are outside this old city wall, the site of which is now followed by the Sadovaya avenues. These semi-circular roads around the Kremlin are intersected by radial roads which passed through the gates in the city walls. As a result, Moscow has a well-developed cobweb road pattern (see Fig. 141).

(b) The Regional Position and Function of Moscow

Moscow is situated at the hub of the waterways of Western Russia. In the early days it was connected by means of short portages to the Dnieper, Don, Dvina, Volkhov and Narva, as well as being on the Volga tributary named after itself.¹ It was easy to travel from the Volga system across the Urals into Siberia.

When once Ivan the Terrible had brought the Tatar Khanates of Kazan and Astrakhan under the control of Moscow, the city became a centre of foreign merchants, dealing in Siberian furs, and silks, as well as spices and handicraft articles from the East and the West (see Figs. 52 and 55).

Just as with London, a town becomes an important centre for defence, communications and trade; and then other functions are assumed. As a result, the town grows like a snowball. Moscow became the capital after Novgorod and Kiev. This led the Metropolitan or head of the Orthodox Church to choose "Mother Moscow" as his residence in 1345. The capital city usually becomes the centre of civil administration and this in turn

¹ It is usual for the river-name to be older than the town and so Moscow is probably named after the river on which it now stands.

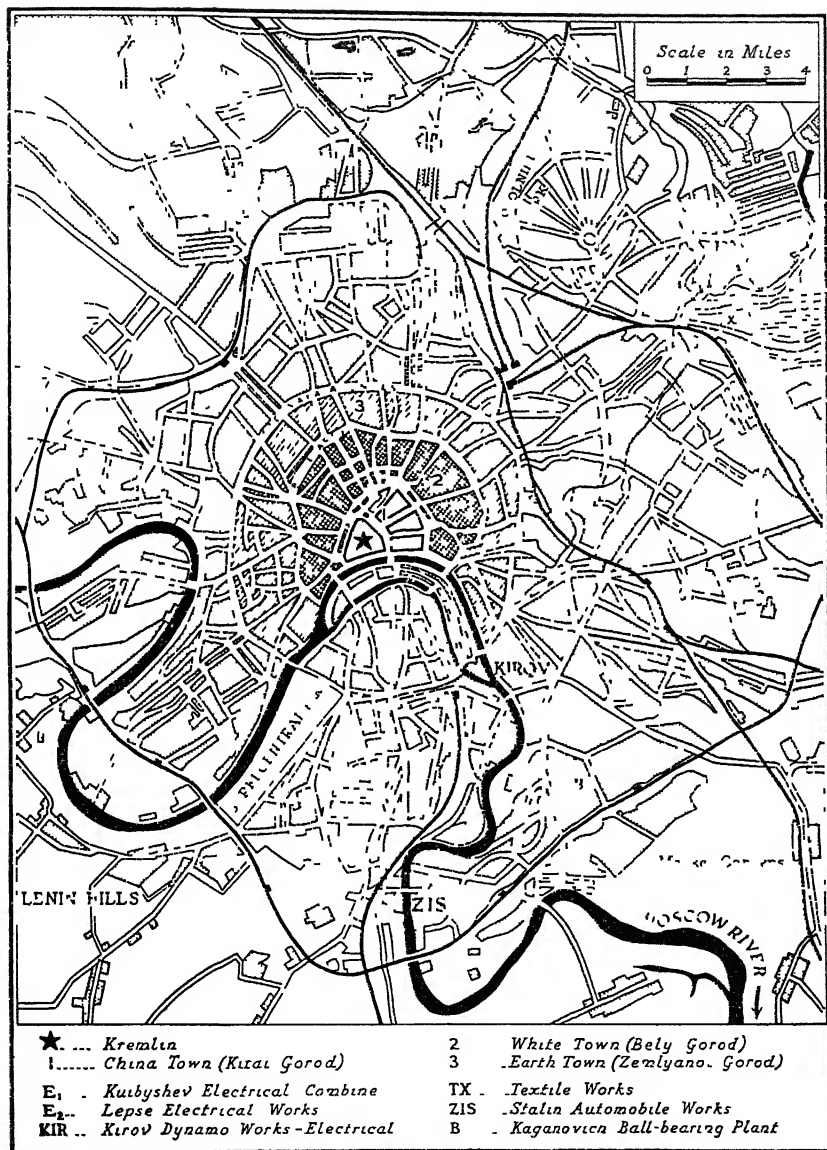


Fig 141 — THE SITE AND PLAN OF MOSCOW

attracts people to the capital to work in the civil service. As the centre of church life, Moscow became important as a training centre for priests, in addition to being noted for its cathedrals, services and offices dealing with ecclesiastical matters. As the centre of the Church, Moscow grew into an even more important city than any other in Russia.

In the early eighteenth century Moscow forfeited some of its political and economic importance; for in 1709 Peter the Great transferred the capital to St. Petersburg. However, industry and trade remained; and although the monarchs were buried in St. Petersburg they came to Moscow to be crowned.

In the eighteenth century Moscow added to its importance by becoming the centre of art and learning. The first Russian University was founded here, and later in the nineteenth century theatres like the Bolshoi were built. To-day Moscow is still the greatest centre for art and culture in the Soviet Union, but culture is not restricted to the capital. Theatres, schools, museums and universities have been built in all parts of the Soviet Union, and no misguided nationalism causes Russian culture to be thought the highest and only culture. Moscow has the first Gypsy theatre in the world. Plays are given in the winter season to Moscow audiences, but the actors tour the country in the summer. Thus the capital is enriched by the provinces, and the capital enriches the country.

After 1860 when the peasants were freed, Moscow attracted them by the development of its textile and handicraft industries, and Moscow became a great industrial city despite its great disadvantage in having poor coal and iron resources (see p. 235). Before the Revolution it was a city of narrow streets, crowded wooden "shacks" with fine residential quarters for the merchants and aristocracy in the outskirts. In 1871 the population of Moscow was 602,000, but this had grown to 2.03 million by 1927 and it was recognised quite early by the Soviet Government that Moscow must develop according to a plan, or the growth of the capital would be chaotic. This plan was approved in 1935 and was to cover at first a ten-year period.

Moscow's factories produce 15 per cent. of the total industrial output of the country, and renowned enterprises, like the Hammer and Sickle Metal Plant, the Stalin Automobile Plant, the Kuibyshev Electrical Combine and the Kaganovich Ball-Bearing Plant, turn out industrial products and supply electrical fittings, machine-tools and instruments of precision. Further industrial development is now strictly controlled. A green-belt from which industry is precluded surrounds Moscow, and the population has been limited to 5 million, which was rapidly being approached in the early 1940's.¹

As a result of the dominating position of Moscow in the late nineteenth century, it became the centre of the road and railway network. This has made it a great nodal-point, and the centre of transport (see Fig. 117).

¹ Population in 1939 = 4,137,018

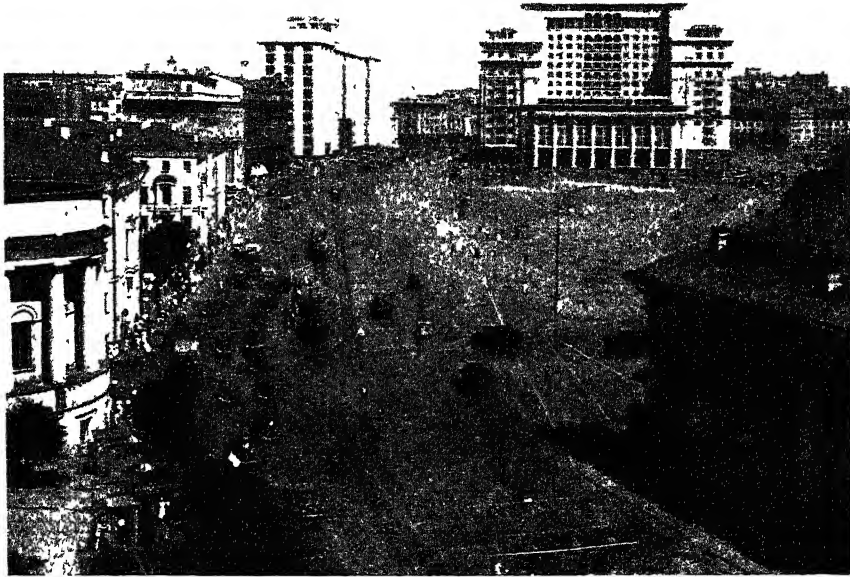


Plate 82 —MANEZHNAYA SQUARE, MOSCOW

The large squares and wide roads strike the foreign visitor to Moscow. The new Moscow Hotel, facing the camera, is one of the largest in Europe, with over 1000 rooms, a swimming pool and is faced with granite. To the left is the building of the Council of People's Commissars. Moscow University is in the left foreground.

The Moscow-Volga canal has transformed it into an inland port of supply. The raising of the level of the Moscow River has necessitated the construction of eleven new bridges which were completed between 1936 and 1938, and the rivers of Moscow have been lined with over 32 miles of granite embankments. These now provide some of the chief thoroughfares of the city.

Moscow's own transport has been improved, the old cobblestone streets have been surfaced with asphalt and ferro-concrete. The old horse-cab, the "drozhky," has been replaced by the trams, trolley-buses and motor buses, which carry millions of passengers daily. The first thing that strikes the visitor in Moscow is the wideness of the streets (Plate 82). The main ring and radial roads are all being widened and straightened, to about 100 feet and more. In this connection it is really fascinating to see a power station, a historical monument, or even a hospital being bodily rolled back for street widening. A building in Gorky Street was moved 150 feet, in another case, a block of flats was moved whilst all the gas,

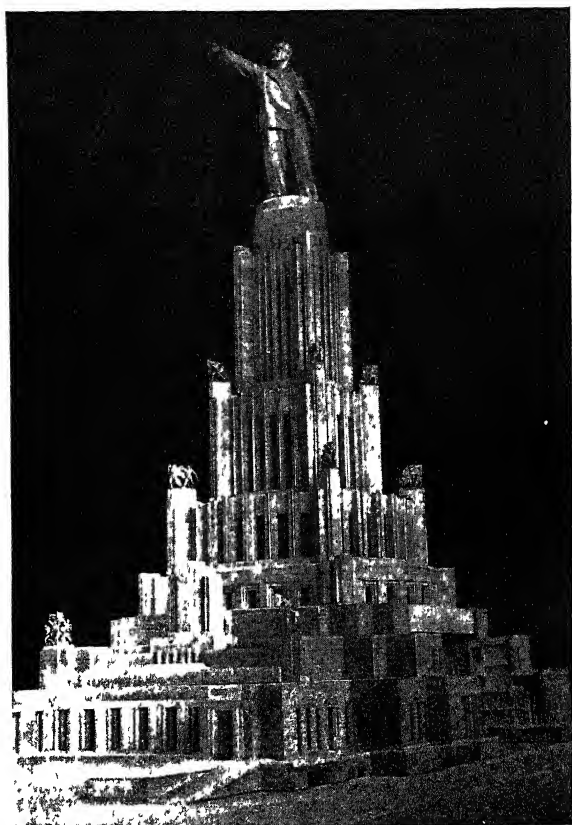


Plate 83—MODEL OF THE PALACE OF SOVIETS,
MOSCOW

many flats intended for one family are still being shared. However, this is an improvement on the average of twelve people per room, which was quite common before 1920. Moscow citizens are largely flat-dwellers for the advantages are that with cheap central-heating they are warmer in winter, and there is less pressure on space. Again, flats are convenient where both husband and wife go out to work. Moscow is developing central-heating plants which pipe the heat to many municipal buildings and flats. These use heat which would otherwise be wasted by industry (see also p 210)

It was in 1918 that the Soviet Government was transferred to Moscow, and since then the appearance of the capital has altered, but the best of the

electricity and water services were maintained, and the people slept blissfully unaware in their beds. Not only are buildings moved but, if necessary, structures weighing thousands of tons can be turned to face another street. Buildings which are not to be preserved are blown up, and rapidly cleared, for there are no landlords to obstruct street improvements in Moscow.

Housing has always been a problem for Moscow. Nearly all the wooden slums have now gone and many blocks of flats, some three-storey, some seven-storey and over, are being built. Many of these are to be found in the new south-western suburbs near the Lenin Hills (see Plate 81). Overcrowding remains, and

old remains. There are examples of baroque architecture as in the cathedral of St. Basil's with its fantastic onion-shaped domes, work of Italian masters in the Kremlin churches and now the tall concrete buildings of modern straight-line art tower above the sky-line of the capital (Plate 81). When the Palace of the Soviets is completed it will be the tallest building in the world, 1356 feet high and surmounted with a giant statue of Lenin 328 feet high. The great hall will have seating capacity for 21 000 people. No amenity is to be lacking, huge vacuum-cleaning stations in the basement escalators and lifts capable of clearing 40 000 people in about fifteen minutes. Another striking feature will be a relaying system whereby a person can listen to a foreign tongue being spoken and by picking up earphones attached to his seat can hear the speech in his own language. This Memorial Palace of Soviets pitches the key in which Moscow is being replanned. It is to be a city with bold perspectives, a live and vital city, striking a balance between industrial development and rural amenities. This is the pattern to be followed in the whole Soviet Union, and Moscow is to be a worthy capital for such a country.

POSTSCRIPT

THE story of the achievements of the Red Army, of the heroism and fortitude displayed by the partisans, of the ability to improvise and carry whole factories with their workers for hundreds of miles, seems to have surprised a world at war. The fact that the Red Army is strong, is due to the fact that Russia is strong; and no country can really have strength in war unless she has been strong in practising the arts of peace. A little over twenty-five years ago, Russia was one of the most backward countries of the whole world; a land of the wooden plough, of illiterate peasants, ill-governed by a cruel despotism. Industry relied on raw materials brought thousands of miles, and on a supply of cheap labour. Men, women and children worked ten and twelve hours a day for a mere pittance. The towns were squalid. The villages were the homes of superstition and disease. The geography of this old Russia has been written, but if the geography of the new Russia—the U.S.S.R.—had been known, and understood, there would have been no cause for surprise at the events of recent years.

What is it that makes the Soviet Union a member of the "Big Three"? In sheer size, we have noted how the Soviet Union covers the largest continuous area in the world having an area of 8 million square miles. It stretches "From the Arctic seas to Samarkand". In the north, its shores are within about 600 miles of the Pole, and the south of Central Asia approaches the equator as nearly as the island of Sicily. The climate, therefore, ranges from Arctic to sub-Tropical, from a region where polar bears can thrive to one of tigers, from Arctic tundra to camels, oases and hot deserts.

In population, the U.S.S.R. comes third in the world after China and India, and includes within its frontiers one-twelfth of all the people in the world. In these respects, therefore, Soviet Russia is great, and this signifies potential greatness in other respects. The Russia of 1913 possessed in fact, more coal, iron, petroleum and other useful minerals than Soviet Russia in 1940, but most of them lay in the ground, unknown and undeveloped.

It is to the building of a new heavy industry, according to a definite plan, that the Soviet Union owes its importance as an industrial power. From 1928 onwards, the leaders of the people built and planned, planned and built. They toiled to make life fairer but although they worked and hoped for peace they had to prepare for the defence of the New Russia. The price of this was very great. Every tank, every gun, meant fewer houses, fewer clothes and fewer luxuries.

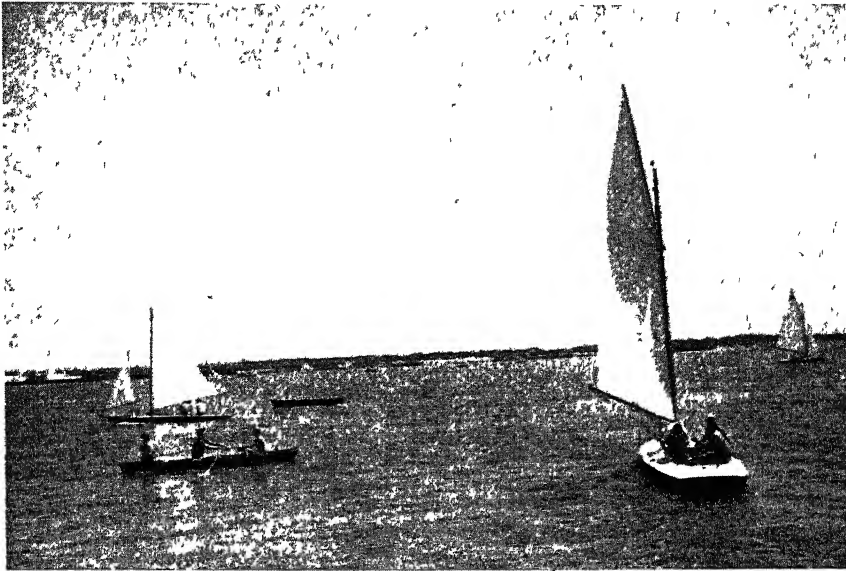


Plate 84—YACHTING ON THE VOLGA.

The Moscow citizens enjoy yachting or riding in speed-boats along the Volga or the large artificial lakes concerned with the Moscow-Volga Canal

We have noted the redrawing of the map of the U.S.S.R. Between 1913 and 1939 coal production not only increased by five and a half times but new areas of coal production developed. Oil production increased four and a half times and new fields were discovered and worked in the "second Baku," between the western slopes of the Urals and the Volga. The barren Arctic desert now has large well-equipped industrial plants, like the apatite mines at Kirovsk, and the nickel works at Norilsk. Salt is worked in Lakes Elton and Baskunchak in the Lower Volga ; sulphur comes from the deserts of Central Asia. The Soviet worker produces every day three and a half times more in both kind and quality than did his grandfather during Tsarist times. This productive efficiency is slightly behind that of America and Britain, which is not surprising, since a country cannot train technicians to invent complicated machines, to make them and then to know how to use them in five minutes. What has been achieved is truly remarkable, and to expect more would be unreasonable. However, the late Mr Wendell Willkie reported in 1943 that the factories of the Urals surpassed the output of the best in U.S.A. This change in the productive power has been largely due to the development of electricity and the Stakhanov movement (see p 199).

Now, the Soviet Union is second only to the U.S.A. in the electrification of industrial processes. During the period of the Five Year Plans giant power-plants have been built on the Dnieper and at Kanakir and Dzorotet in Armenia. Other plants depend on coal, oil, peat or shale for fuel, as at Shatura near Moscow, or Chelyabinsk in the Urals. Thus the Soviet Union is great in possessing motive power which replaces the hand-power of over-worked industrial slaves.

The developments in agriculture have been equally remarkable. Many millions of small peasant farms, which knew not the rotation of crops, or artificial fertilisers, or the use of machines, have been entirely replaced. The map has been completely changed. Instead of the old strips in the open fields, a true stamp of feudalism, there has grown up the system of collective farms. On these over 700,000 tractors and combine-harvesters from over 6500 Machine Tractor Stations reduce the work of man. They plough deeply and with speed. They thresh the corn as they cut it. So now Soviet agriculture produces much more grain with less labour. No longer does the South Ukraine produce the food for the Moscow region, or need over 2 million seasonal workers at harvest-time. Wheat now grows farther north, and both grains and vegetables can be seen in fields beyond the Arctic Circle. Science has been applied to agriculture. The town and country are growing more closely together. A new "intelligentsia" is to be found in the village; there are now people who can drive a tractor, who can detect plant diseases and apply a cure; people who can read, write, and teach others. At the same time, industry provides the agricultural regions with their machines, whilst the country supplies the industrial workers of the towns with food and drink.

Greatness in industry and agriculture provides a firm basis for economic strength, but this is not the whole story. A country may produce scientists like Tsitsin, Michurin or Yefremov (see pp. 152-153), but every activity of life, whether it be medicine, agriculture or industry, should be approached by the same scientific method. This involves a full and equal opportunity for education, and in this respect the Soviet Union has changed illiterate peasants into literate citizens, living in town and country. Secondary schools have been increased eight-fold.

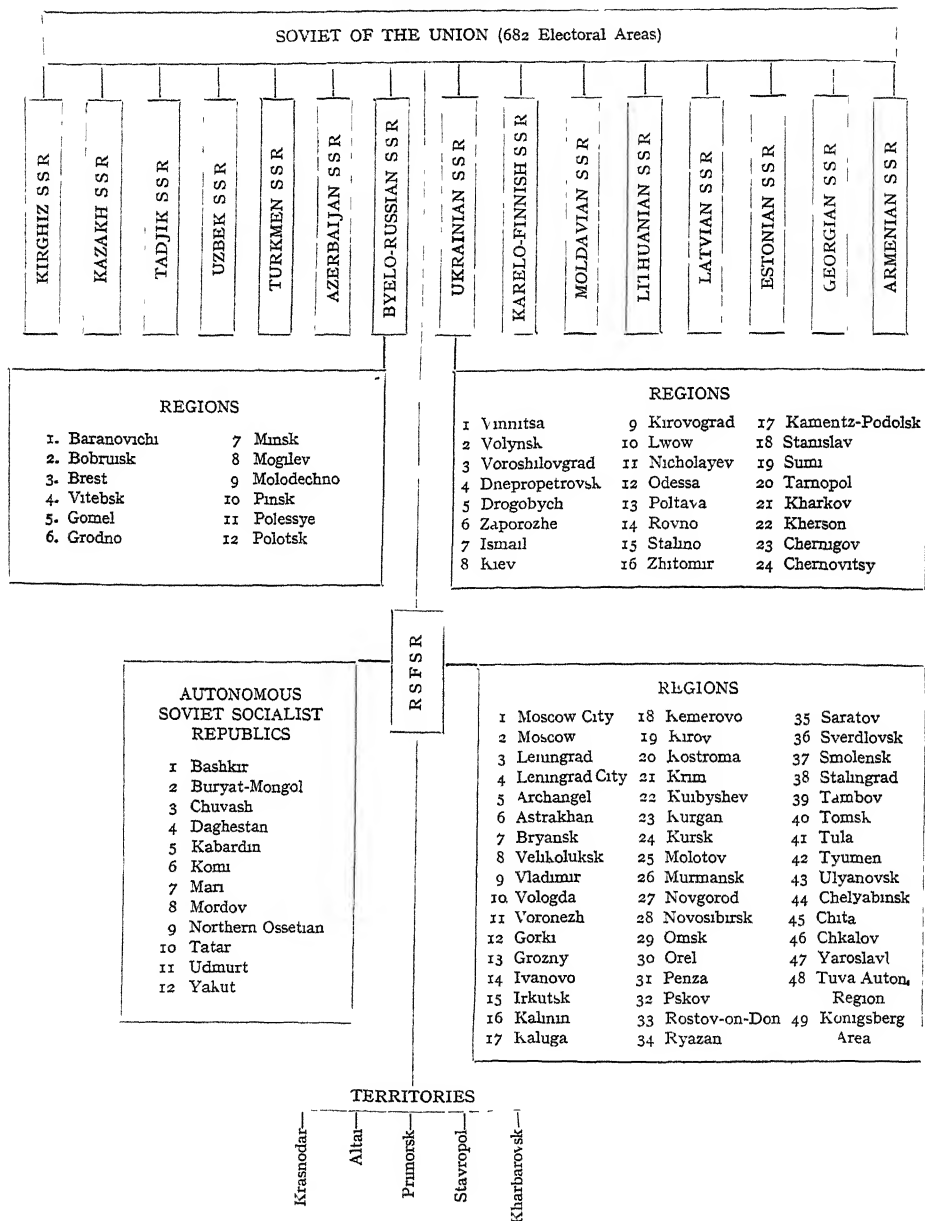
It cannot be doubted that the U.S.S.R. derives much of its strength from material things, but a nation must also possess spiritual strength. It must have faith in its own destiny. This is not easy to assess. Just like the tone of a school or the morale of an army or team, although difficult to define it is most obvious when present. Soviet Russia has an enormous reservoir of spiritual, moral and political strength in the heart of the Russian people. Some of it may be traditional staunchness, a function of the hard fight that the Russians have had with the climate and with their land through the centuries. Nevertheless, it seems impossible not to conclude that the Soviet political system has been entirely responsible for the

great changes. These changes have not been accidental—they have not evolved by “natural processes”—they have been planned. Comparison with other democratic systems would be invidious here and does not arise. As Lenin once wrote about the political machine.

“Our apparatus may be a bad one, but it is said that the first steam engine to be invented was also a bad one, and it is not even known whether it worked or not. That is not the point: the point is that it was invented.”

APPENDIX I

MAJOR ELECTORAL AREAS FOR THE ELECTIONS TO THE SUPREME SOVIET OF THE USSR
(ELECTIONS OF 1945)



N.B.—For the elections to the *Soviet of the Union* these areas are further divided into smaller electoral areas set up on the basis of 300,000 people to each. These each elect one deputy. As in England, the electoral areas or constituencies are further subdivided into wards where the people actually vote and where the counting takes place. These same wards are used in the elections to the *Soviet of Nationalities* (see page 74 and end-paper)

APPENDIX II

SOVIET OF NATIONALITIES

(657 ELECTORAL AREAS)

16 Union Republics		16 Autonomous Republics		9 Autonomous Regions		10 National Areas	
25 Deputies from each		11 Deputies from each		5 Deputies from each		1 Deputy from each	
1 R.S.F.S.R.	9 Armenia	1 Abkhazian	9 Mari	1 Adyghe	1 Aginsk-Buryat-Mongol	1 Aginsk-Buryat-Mongol	
2 Ukrainian	10 Kazakhstan	2 Adjar	10 Mordov	2 Gorno-Badakhshan	2 Komi-Permyak	2 Komi-Permyak	
3 Byelo-Russian	11 Karlo-Finnish	3 Bashkir	11 Nakhichevan	3 Jewish	3 Koryak	3 Koryak	
4 Azerbaijan	12 Moldavian	4 Buryat Mongol	12 North Ossetian	1 Naigorno-Karabakh	1 Nenets	1 Nenets	
5 Georgian	13 Kirghiz	5 Daghestan	13 Latvian	5 Onot	5 Iamyr	5 Iamyr	
6 Turkmen	14 Estonian	6 Kabardin	14 Udmurt	6 Tuva	6 Ust-Ordinsk Buryat-Mongol	6 Ust-Ordinsk Buryat-Mongol	
7 Tadzhik	15 Latvian	7 Kara-Kalpak	15 Chuvash	7 Khakass	7 Khanty-Mansi	7 Khanty-Mansi	
8 Uzbek	16 Lithuanian	8 Komi	16 Yakut	8 Chetkess	8 Chukot	8 Chukot	
				9 South Ossetian	9 Evenki	9 Evenki	
					10 Yamalo-Nenets	10 Yamalo-Nenets	

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